INNOVATION FOR LIFE
WORKING TO CREATE BETTER MEDICAL OUTCOMES FOR CANADA AND THE WORLD
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The National Centres of Excellence CECR programs accelerate the commercialization of cutting-edge research by providing financial support, integration with industry and government expertise.

NCE support has enabled CSii to accelerate the commercialization of our image guided surgical robotics projects and to serve as a research accelerator with outstanding medical projects on the horizon.

Funding from the National Centres of Excellence for CECRs contributes to job creation, economic growth, academic achievements and a healthier Canada.
Centre for Surgical Invention & Innovation

COMMITTED TO ENHANCING THE QUALITY AND ACCESS TO CARE FOR ALL CANADIANS

VISION

REQUIREMENTS DRIVEN > RESEARCH ENABLED > MARKET FOCUSED

By creating the next generation of surgical technology and tools CSii will seek to:

- Improve patient outcomes by enabling more targeted, less invasive procedures.
- Improve patient access through development of tele-operable systems.
- Identify, develop and commercialize new research and innovation in the areas of tele-surgery, as well as minimally invasive, robotic, and image guided surgery.

MISSION

By achieving this vision we hope to make new avenues for care possible in the areas of surgical and diagnostic technologies that will improve the current standard of care and strengthen Canada’s presence as a medical innovator.

Enable care providers to gain new techniques and skills that would not be possible without these technologies.

GOALS

- To enhance the surgical and diagnostic capability of robotic technology, potentially improving the dexterity, automation, or interaction with new image guidance modalities.
- To increase and improve the ability of remote tele-presence surgery using these robotic interventions to reach communities in need of surgical expertise.
- To support the development of new minimally invasive technology and image guided interventions that will better leverage the advantages of emerging innovation in medical imagery and provide more effective, less invasive care to patients.
Value Proposition for Image Guided Robotics

Image guided robotics extend the reach, dexterity, and accuracy of physicians, enabling them to do new things they are currently unable to do with direct hands-on techniques. The ease of use creates times savings that improve efficiencies of care and will help to improve patient flow.

Patients benefit from faster, more accurate procedures that reduce trauma, complications and invasiveness resulting in a speedier return to their normal activities.

The value of image guided robotics to hospitals is substantial, increasing OR availability for additional procedures. Fewer complications result in a higher degree of patient satisfaction while the potential change in workflow yields an increase in efficiencies of staff and facilities while maximizing the use of specialists.

Key Beliefs

Precision cancer detection will progress by means of a variety of processes; MRI, nuclear imaging and genomics.

Minimally invasive cancer biopsy and ablation will progress rapidly and revolutionize cancer detection and treatment. The technology currently in development at CSii will reduce costs and improve care by deskilling, treating patients earlier, shifting the site of care with procedures that are less invasive and require fewer hospital admissions.
Dear Friends & Colleagues: Over the last year, CSii has increased our focus on the commercialization of our Image Guided Automated Robot (IGAR). After detailed market assessment, the Board decided to focus the first commercial application of IGAR to early detection and treatment of Breast Cancer. The recent trends suggest that the science of genomics will lead to identification of women with higher than average risk of breast cancer who would then require more sensitive and accurate imaging with MRI technology that is capable of identifying suspicious lesions at significantly earlier stages and earlier ages than a mammogram or ultrasound examination. The limitation to the current ability to biopsy and ablate (destroy) lies with the size of these small lesions, which require the radiologist and surgeon to identify the region of the breast containing the suspicious lesion and then remove a sizable sample to hopefully include the lesion in question, which may only be few mm in size. Our automated robot is capable of placing the biopsy and ablation tools within 1 mm of the lesion in question with high degree of targeting accuracy, improving sampling, reducing the morbidity and pain of the procedure, reducing time in the MRI suite and saving significant dollars as a consequence. It will also allow all radiologists to perform this procedure equally well, regardless of the number of cases per year, and move the site of treatment from operating room to radiology suite for a significant number of patients.

In year 2 at CSii we have built the first prototype IGAR-Breast that has just completed testing of the system in the MRI environment, and succeeding with flying colors. We are now proceeding with the building of the first of three clinical systems, which will be used to perform the human clinical trials and validation. This will be completed by early 2013 and we have already identified the clinical sites that will undertake the technology evaluations. Over the next year, we will also engage the Health Canada and FDA to ensure that all design elements and clinical testing of the efficacy and safety of the system is acceptable to both authorities.

Throughout the last year our Commercialization group has worked on the IP strategy, beginning to identify and securing the necessary IPs, and are starting to develop the detailed business case that will outline the P&L for the first 10 years.

Next, we will be working to develop a detailed plan for the marketing and sales of the first systems in the first 5 years of commercialization. In addition to the primary IGAR robot, we are currently evaluating the business case for developing the disposable tools for the system internally versus partnering with existing industry.

We envision our first systems will be available for sale by 2015. However, the centre will need ongoing support to continue the commercialization process through further development of additional capabilities as well as training and ongoing validation of the IGAR-Breast system.

The centre continues to incubate a number of other major systems, which are at earlier stage in their development, and we hope that eventually the royalty from commercialization of Breast - IGAR will allow CSii to become self sufficient by 2019 and to continue to incubate the other robotic platforms and technologies, which we are working on.

Throughout all our endeavors we remain true to our vision of developing technologies, which will improve the quality and access for patients throughout Canada.
A Passion for Achieving

Dr. Mehran Anvari
CHIEF EXECUTIVE OFFICER AND SCIENTIFIC DIRECTOR
CENTRE OF SURGICAL INVENTION AND INNOVATION
The Centre for Surgical Invention and Innovation (CSii) has now completed two years of operation. We have progressed well in that time on two fronts.

Firstly, we have made good progress in the design and development of a vision enabled robotic platform for the detection and treatment of early stage cancer. While it has a breadth of potential capability there are particular requirements in every application that require special capabilities. CSii has chosen breast cancer as the first application. The robot and the tooling are being developed for this.

Secondly, we are gaining awareness of the challenges involved in making this kind of development available to the world through commercial channels. We have more time for this, because of the need for qualification, effective demonstrations and approvals, but it is a very big task and we are preparing for success.

We continue to be greatly advantaged by the passionate and visionary leadership of a great surgeon, Dr. Anvari, and by experienced and highly talented staff and research teams, and by the commitment, discipline and depth of knowledge of our principle, industry partner, MDA. CSii’s Board of Directors is a remarkably strong group of people who are committed to seeing that this very challenging venture is managed well for sustainable success. We are already aware that the success we are aiming for will not be achieved in the next three years. We are beginning to explore how we will sustain this to success in the coming years.

H. Douglas Barber
Chair of the Board
The Centre for Surgical Invention and Innovation (CSii) has continued to pursue a vision of developing surgical robots and technologies that enhance the quality and access to healthcare for patients in Canada and throughout the world.

This year CSii has made substantial progress by focusing attention on the growth and development of our primary robotics project, the IGAR breast platform. I am pleased to report that CSii has managed to achieve some outstanding milestones in the development of new image guided surgical robotics (IGAR) designed to aid in the detection and treatment of cancer in its earliest stages.

Together with our partners at MDA, St. Joseph’s Healthcare in Hamilton, and McMaster University, we have aggressively moved forward to advance the development of the IGAR breast application, the first in a series of image guided automatic robotic platforms that will revolutionize the healthcare system. Specific progress in year 2 includes the identification and inclusion of several clinical breast and radiology experts to ensure that our product is developed to provide maximal clinical benefit and acceptability.

The CSii team has done extensive research in the market place to ensure the development of IGAR is consistent with the needs of the care pathway, an action that should serve to maximize the commercial potential for our products in North America and abroad. As the project unfolds we are working to build a critical IP portfolio for IGAR that will secure our technological innovations as we plan the strategic management of our intellectual property.

Together with the distinguished leadership the Centre has attracted to the Board of Directors we have made great strides in realizing our objectives and our potential and will continue to do so as we progress into our third year.

CSii has also worked closely with the Ministry of Health and Long Term Care (MOHLTC) to design the protocols and manage the development and launch of the Ontario Bariatric Network, the Bariatric Central Referral Portal and Bariatric Registry.

Together with the Bariatric Centres of Excellence and the Bariatric Regional Assessment and Treatment Centres in Ontario, CSii has developed a means of collecting data and developing best practices that will provide ‘made in Canada’ solutions to how to best treat obesity and the associated challenges it poses to patients, their families and health care providers.

In keeping with our commitment to public outreach and education, this summer CSii hosted the Innovation Nation Conference dedicated to innovation in all of its forms. The Conference showcased individuals who are focusing their talent and intellect to create a better world though innovation in science, medicine, engineering and technology. Networking opportunities enabled them to interact and grow from the encounter and provided students participating in the CSii sponsored robotics competition with successful role models to inspire their endeavours.

CSii continues to remain in the news, capturing the interest and imagination of news reporters and television producers for the groundbreaking work we are engaged in and for the potential impact our work will have on the delivery of health care. This fall the History Channel will take a look at the career of CSii CEO and Scientific Officer, Dr. Mehran Anvari and his distinguished career as a pioneer in telerobotic surgery and an innovator with the new IGAR platform that has developed under his direction.

The Centre is committed to enhancing Canada’s role as a leader in health care innovation, sustaining a successful incubator and accelerator of robotic and tele-surgical technologies, expanding the boundaries of medical research and excellence, and establishing Canada as a global leader in healthcare technology.

We look forward to another successful and busy year!
Board of Directors

Mehran Anvari
Scientific Director, Centre for Surgical Invention & Innovation

Douglas Barber
Chair, Professor in Residence, McMaster, Founder of Gennum

Joseph Mancinelli
Vice President & Regional Manager, Labourer’s International Union (LIUNA) (Independent)

Paul Milne
Lawyer, Simpson Wigle Law (Independent)

William Orovan
Chair, Department of Surgery, McMaster University

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Integrated Vice President of Laboratory Medicine & Diagnostic Imaging

Kevin Smith
President & Chief Executive Officer,
St. Joseph’s Healthcare Hamilton

Dave Williams
Director,
McMaster University
THE INTERNATIONAL ADVISORY COMMITTEE IS
EARLY INNOVATIONS FOR COMMERCIAL VIABILITY

Dr. Mark B. Knudson, EnteroMedics Inc.

Dr. Knudson is founder, President and Chief Executive Officer and Chairman of the Board of EnteroMedics Inc., which was established in late 2002 to develop and commercialize a new therapeutic platform for treating a wide range of acute and chronic diseases that are mediated by the vagal nerves. Prior to this, he served as the President at Johnson and Johnson Professional Diagnostics, following Johnson and Johnson’s 1986 acquisition of Arden Medical Systems. He founded Arden in 1983 and was its Chairman, President, and Chief Executive Officer. Dr. Knudson has also held positions in Research and Development Management at Cardiac Pacemakers, Inc., (CPI-Guidant) and as a partner of an early stage venture capital firm. His inventions have been the basis for the founding of nine companies, in several of which he served as founding Chief Executive Officer. Prior to their successful acquisition, Dr. Knudson founded and served on the Board of Directors of Arden Medical Systems, Inc., Integ, Inc., HeartStream, Inc., InControl, Inc, and was a Member of the Advisory Board at Artesian Capital. He was a member of the faculty of the University of Washington School of Medicine and is also a Fellow of the American Heart Association. Dr. Knudson was the recipient of an Individual Post-doctoral Fellowship Award from the National Institutes of Health. Dr. Knudson is the holder of over 40 United States patents. He holds a Ph.D. in Cardiovascular Physiology from Washington State University and a B.S. degree in Biology from Pacific Lutheran University.

Mr. Gex is the Chairman of Cianna Medical, Inc. which is a women’s health company dedicated to the innovative treatment of early-stage breast cancer. When diagnosed early, most women have the option to save their breast by choosing breast conservation therapy (BCT). The company’s mission is to make BCT available to more women, by developing new approaches to delivering follow-up radiation therapy. Cianna manufactures and markets the SAVI™ breast brachytherapy applicator. The SAVI technology allows physicians to precisely target radiation to the area that needs it most, minimizing exposure to healthy tissue. Equally important, women can return to their normal family and work schedules after just 5 days of treatment. Cianna’s commitment is to improve care and reduce the burden that breast cancer treatment places on women and their families.

Steve Gex previously served in the same post at BioLucent, Inc., a women’s health company dedicated to the early detection and treatment of breast cancer. The company developed the MammoPad® breast cushion to reduce mammography discomfort and ensure high-quality images. BioLucent was acquired in September 2007 by Hologic, Inc. Prior to BioLucent, Mr. Gex co-founded and served as President and CEO of Biopsys Medical, Inc., the maker of Mammotome, a non-surgical breast biopsy device used to diagnose breast cancer. At Biopsys, Mr. Gex guided the company’s initial public offering and subsequent sale to Johnson & Johnson in 1997. He has also served on the boards of directors for several other medical device companies. Mr. Gex has also served as Vice President of Marketing at Laurus Medical Corp and Applied Medical Resources, both of which he co-founded. Additionally, Mr. Gex has held senior management positions in marketing, business development and manufacturing operations at Edwards Laboratories, a division of American Hospital Supply Corporation. Gex holds a Bachelor of Science degree in Marketing from San Diego State University in San Diego, CA.
**Dr. Leslie Levin**, MB, MD (Birm), FRCP(Lon), FRCPC

**TASKED WITH REVIEWING NEW IDEAS & INTEREST TO BOTH DOMESTIC & WORLD MARKETS.**

**Dr. Levin** is a member of the Senior Management Committee of the Ministry of Health and Long-Term Care (MOHLTC), the Senior Scientific, Medical and Health Technology Advisor to the Ministry and Head of the Medical Advisory Secretariat (MAS) which is mandated to provide evidentiary platforms for policy decision making. In this capacity, Dr. Levin has overall leadership in evidence-based analysis relating to all health technologies including equipment, devices, medical and surgical interventions and health systems. Dr. Levin works closely with the Divisions in the MOHLTC, leadership of Academic Health Science Centres, academia, and industry. He was instrumental in creating the Ontario Health Technology Advisory Committee (OHTAC), which advises the Ministry of Health and Long-Term Care and the Health System on the adoption of non-drug health technologies. Dr. Levin initiated and has maintained a leadership position in the Ontario technology field evaluation program, which tests new and existing technologies for evidence of effectiveness and cost effectiveness through post-market studies. Field evaluation studies are conducted by academic units through wide involvement of key end-users of the technology and address areas of uncertainty prior to commitment to large multi-year investments.

Dr. Levin initiated the development of mega-analysis, which examines all technologies around disease conditions and health states to assess the dominant technologies that maximize patient outcomes. This has been increasingly used as a tool for MOHLTC policy decision-making. He also facilitated the development of micro economic policy models by McMaster University (PATH) and University of Toronto (THETA) as a decision tool in evidence in creating a unique evidence based decision making for chronic diseases such as diabetes, cardiovascular disease and pressure ulcers.

He initiated the Cancer Care Ontario evidence based cancer guidelines initiative as Vice President of Cancer Care Ontario, and was instrumental in creating unique evidence — based provincial cancer drug program. He has published in addition to numerous other cancer research publications. He is a member of the HTA Council of the International Society of Pharmacoeconomics and Clinical Outcomes (ISPOR). There is growing international awareness and recognition of Ontario’s leading position in technology assessment through its innovative approaches. For example, in 2008, Dr Levin was Invited to present the Ontario approach to academia and governments in the U.S.A., England, Scotland, and Canada and was a keynote speaker at the recent Asia - Pacific Policy Summit on the Foundation of Quality and Provision of Health Care in Shanghai.

Dr. Levin is a Professor in the Department of Medicine, University of Toronto and is a senior consultant in medical oncology at the Princess Margaret Hospital. Prior to this, he was Professor and Chair of the Department of Oncology at the University of Western Ontario. The University of Birmingham for research in cancer immunology awarded his M.D. and he has Royal College certification in Internal Medicine from the U.K. and Canada.
The right blend of experience and knowledge

Dr. Mehran Anvari
CHIEF EXECUTIVE OFFICER AND SCIENTIFIC DIRECTOR
CENTRE OF SURGICAL INVENTION AND INNOVATION
Dr. Anvari is a professor of surgery at McMaster University. In 2004, he was appointed to the newly created Chair in Minimally Invasive Surgery and Surgical Innovation, and in 2005, he became the founding director of the McMaster Institute for Surgical Invention, Innovation and Education.

He is the founding director of the Centre for Minimal Access Surgery (CMAS) and CEO and Scientific Director of the Centre for Surgical Invention and Innovation, affiliated with McMaster University and with St. Joseph’s Healthcare Hamilton.

His body of work has been internationally recognized and acknowledged. Time Magazine has touted the Centre for Minimal Access Surgery (CMAS) as "sculpting the next frontier of medicine." Through CMAS, the first of its kind in Canada, Dr. Anvari has promoted the use of minimal access techniques in all surgical specialties and has focused on improving patient outcomes, minimizing the physical, emotional and financial impact of surgical procedures on patients and reducing hospital admissions and the associated costs.

The recipient of the 2009-2010 ORION Award for Leadership, Dr. Anvari has also been awarded the Government of Ontario Diamond Award for Innovation in Technology, the Government of Canada Gold Medal of Distinction for Telerobotic Surgery and the McMaster Innovator of the Year Award (2009).

His dedication to the ongoing training and mentoring of surgeons through CMAS has resulted in creation of a series of continuing education programs that are unrivalled in scope, subject matter and participation. Under his direction, CMAS has trained over 1200 surgeons through 87 CME programs designed for surgeons from all specialties, providing them with their primary source of training in the newest techniques and applications in the use of minimal access surgery.

Dr. Anvari was one of the first surgeons in Canada to use robotics in surgery, and in 2003 he established the world’s first telerobotic surgical service linking St. Joseph’s Healthcare Hamilton and a community hospital, North Bay General. He was the chief scientific officer for the NEEMO 7 mission (2004), and NEEMO 9 (2006), joint projects of McMaster, the Canadian Space Agency and NASA that were tasked with testing the ability of new robotic and telesurgical technology to allow a non-physician to perform assisted surgery in a contained environment that simulates conditions in space.
COMPANY PROFILE – CSii

The Centre for Surgical Invention and Innovation (CSii) was established in 2009 as a NCE research accelerator.

In 2010 - 2011 CSii has continued its quest to adapt expertise evolving from Canada’s lead in space robotics and minimally invasive surgical techniques and leverage the technology to develop and commercialize a new class of advanced surgical image guided robotic systems which will extend the diagnostic and interventional capabilities of surgeons and health care professionals through increased access, precision and dexterity.

The research driving these technical advances will enable highly effective diagnosis and treatment of disease down to the macroscopic and microscopic cellular levels while reducing the trauma caused by accessing the treatment site.

The development of the Image Guided Automatic Robotics (IGAR) breast platform is the first product of the CSii endeavour to adapt image guided robotic technology to provide a targeted solution to the detection and treatment of cancer.

With the benefit of significant financial support of the Government of Canada through the NCE CECR program, CSii has continued to adapt a multi-disciplinary approach to research and development that has enabled the Centre to combine the medical, engineering, biological, information technology and systems integration expertise available at McMaster University, St. Joseph's Healthcare Hamilton and institutions and corporations located throughout Canada to develop the IGAR breast platform which is expandable and to develop research projects from associated medical fields.

The Centre is committed to attracting exceptional human talent and Canadian industry support to accommodate new development projects working with clinical experts both here and abroad to refine our approach to the development of robotic instruments that have a direct impact on clinical use. CSii will expand its roll to enable inspired research to reach commercialization in record time, obtain the necessary regulatory approvals for medical robotic technologies in Canada and internationally and to provide training opportunities for highly qualified personnel in medical and engineering fields.

This year, CSii has moved to consolidate support of partnerships from the private sector. The Centre recognizes that the commercialization of products is time sensitive and that corporate and academic collaborators need evidence of the return on their investment.

The outstanding success of the CSii Innovation Nation Conference and Robotics Competition reinforced the Centre's commitment to professional development and educational outreach. The Conference brought together some of the finest innovators in North America to share their stories and network with researchers, scientists, physicians, academics and students in attendance. The Robotics Competition engaged enthusiastic teams of university and high school students in the process of demonstrating and presenting their inventions and innovations to a panel of judges for review.

The inspired addition of the student robotics competition infused the Conference with energy and underlined the focus of the event as a glimpse of future developments in applied research, technology and engineering.
MOVING FORWARD – CSii GOALS

**STRIVE**
to facilitate the commercial success of our partners and create revenue streams for new investments in academic research and future product development.

**DEVELOP**
and initiate clinical testing of the first IGAR prototype by early 2013.

**INITIATE**
and better understand the Regulatory requirements to access the market.

**OUTLINE**
a comprehensive marketing campaign to access the market.

**FORMALIZE**
the path to commercialization, identify partners or companies-of-interest.

**CULTIVATE**
a robust pipeline of developing ideas.

**COMMENCE**
work on the early research for the 2\textsuperscript{nd} IGAR device.

**SECURE**
additional funding for our robotic development through grant applications and the identification of potential investors.
CSii has actively cultivated partnerships with corporations, institutions universities and hospitals as well as a collection of highly skilled individual researchers, physicians and engineers, to create synergies that produce valuable new ideas and a better way to achieve our goals in record time. Our partners are valued members of the CSii team.
We’re pleased to be working in collaboration with medical professionals at St. Joseph’s Healthcare, McMaster University and CSi to develop ground-breaking robotic systems for early detection and treatment of breast cancer. Leveraging their extensive medical research and expertise with more than 30 years of MDA’s world-renowned robotics technology developed for NASA’s space program, we’re developing state-of-the-art minimally invasive medical robotic technologies that will dramatically improve patient care and surgical outcomes.

CSTAR excels at closing the gap between medical device innovation and clinical implementation through research, validation and simulation training. In doing so, health care teams and patients have improved access to leading-edge, rigorously tested medical device technologies that are safely and competently applied to patient care.

CSTAR is a collaborative research and education program of LHSC (London Health Sciences Center), Lawson (Lawson Health Research Institute), Western (The University of Western Ontario) and St. Joseph’s (St. Joseph’s Health Care), all located in London, Ontario, Canada.
A central plank of the Mission of St. Joseph’s Health System and St. Joseph’s Healthcare Hamilton is innovation, inquiry, and the advancement of the health sciences. We are extremely proud of our long-standing partnership with first the Centre for Minimal Access Surgery, and now with the Centre for Surgical Invention and Innovation, with whom we share this important outlook.

In less than a decade this partnership has yielded the most remarkable outcomes, from the world’s first telerobotic surgery in 2003, to the mentoring of hundreds of learners, to the exporting of new technologies and new approaches to care, and to major improvements in the care offered to patients through faster healing and less invasive treatment.

This year had seen our collective tenacity continue to pay off as we continue to break new ground in the development of new technologies to support the best possible patient care. We have also continued to receive national and international recognition, and raised awareness of the promise of cutting edge surgical technologies.

As we move into the future, the Centre for Surgical Invention and Innovation’s important mission continues. It is imperative that we continue our work together to break new ground, to dare to dream, and to bring to life the best possible approaches for our patients.

Facilities for CSii & CMAS at St. Joseph’s Healthcare Hamilton include new operating suites which are among the most technologically advanced in North America and are equipped to support minimal access surgery. The two largest suites have been designed and constructed to accommodate image-guided surgery.
Early Computerized Rendering of the CSi & CMAS Advanced Operating Room
The Robarts Research Institute is a key contributor to Western’s research excellence. Focused on the improved detection and treatment of debilitating disease, Robarts boasts 600 people including 43 principal investigators and a powerful suite of core research facilities—from DNA sequencing and flow cytometry resources to ultra-high field imaging equipment and expertise.

Robarts has key strengths in advanced medical imaging, cellular and molecular biology, genomics, immunology, and stem cell biology - an interdisciplinary approach with physicians and physicists, biologists, and biomedical engineers working under one roof with collaboration extending to 20 countries worldwide.

Robarts has experienced commercialization success with more than 80 patents filed, 15 licensing agreements and eight spinoff companies.

McMaster University

Founded in 1887, McMaster University has a long history of commitment to creativity, innovation, and excellence with the teaching, research, and scholarship it engages in. It embraces and inspires critical thinking, personal growth, and passion for learning. It is ranked as one of the top 100 Universities in the world and as a total sponsored research income of over $345 Million dollars – making it the first in the country in research intensity and winning them third place in the Research University of the Year Category. McMaster’s innovation in robotics is well developed and the creation of the McMaster Centre for Medical Robotics in 2008 cements their dedication to excellence in this field.

Collaboration with CSii ensures that the McMaster Department of Surgery is linked to the development of cutting edge surgical devices and expertise developed in conjunction with researchers and professionals within the department of surgery and across a range of professional disciplines that include medical, scientific and engineering expertise, all focused on enhancing the surgeons ability of to efficiently and effectively provide better patient outcomes.

Mo Elbestawi
Vice-President, Research and International Affairs
McMaster University
Ensuring the translation of research discoveries into innovations in the clinic is the primary focus of health sciences research at McMaster University. As one of our major partners, the Centre for Surgical Invention and Innovation (CSii) is working to improve diagnosis, treatment and outcomes for patients through the development of innovative medical robotic platforms. By attracting top talent and combining research expertise with scientific and industry know-how, the CSii is bridging the gap between innovation and commercialization to ensure discoveries result in economic, social and health benefits for all Canadians.
Under the direction of Dr. Wm. Orovan, 2010 was a year of growth for the McMaster University Department of Surgery capping off 10 years of consistent expansion during which the Department has reinforced it’s commitment to integrating innovative clinical care, world-leading research and outstanding educational resources. The Department of Surgery aspires to continue to be a leading Department in academic surgery nationally and internationally. Balancing clinical, research and educational initiatives this year the department announced the creation of the Associate Chair Education role, with Dr. Susan Reid as the inaugural Associate Chair. Since her appointment in early 2010 Dr. Reid has worked with the faculty to put in place many initiatives. Highlights include, the new STEP program (Surgical Teaching Education Program) the international surgery desk headed by Dr. Brian Cameron, and the surgeon scientist program headed by Dr. Sheila Singh. The Department has continued to seek out the best and brightest surgeons and to actively recruit more women surgeons into the department to reflect the increase in female medical graduates.

Collaboration with CSii ensures that the McMaster Department of Surgery is linked to the development of cutting edge surgical devices and expertise developed in conjunction with researchers and professionals within the department of surgery and across a range of professional disciplines that include medical, scientific and engineering expertise, all focused on enhancing the surgeons ability of to efficiently and effectively provide better patient outcomes.

Dr. William L. Orovan
Professor and Chair, Department of Surgery
McMaster University

**Education:** B.Sc., McMaster University, M.B.A., Queen’s University, M.D., from McMaster University, General Surgery Residency, McMaster University, Urology Residency, University of Western Ontario Hospitals, F.R.C.S.(C) Urological Oncology Fellowship, University of Texas (USA) F.A.C.S.

**Awards:** Life Membership Award, Ontario Medical Association (2004), Past Presidents Award, Ontario Medical Association (1999), Recognition Award for Outstanding Contribution to the Community, Hamilton & District Chamber of Commerce January (1998), Excellence in Quality Management of Medical Care Award, College of Physicians & Surgeons of Ontario (1997), Distinguished Service Award, Hamilton Academy of Medicine, (1995-1996), Best Surgical Educator (Golden Scalpel), St. Joseph’s Hospital (1988-1989)

**Professional Affiliations:** James IV Association of Surgeons, Inc., C. D. Howe Institute, Canadian Association for Surgical Chairmen, Association for Surgical Education, Canadian Urological Association, Canadian Academy of Urology, Canadian Association for Clinical Surgeons, Canadian Urological Oncology Group, Urological Society for Transplantation and Vascular Surgery, Royal College of Physicians and Surgeons of Canada, Ontario Medical Association, Hamilton Academy of Medicine, American College of Surgeons, American Urological Association, Society of Urological Oncology
Marie Fairgrieve
Manager, Centre for Minimal Access Surgery

As Manager of the Centre for Minimal Access Surgery, Marie Fairgrieve has an outstanding capacity for handling the myriad of details involved in successfully managing a centre devoted to advancing skill in all surgical specialties. Experienced and energetic, Marie Fairgrieve juggles a portfolio of priorities involving logistic planning, program scheduling for the ever growing roster of CMAS continuing education programs and conferences, statistical and financial reporting, grant applications, website and partnerships outreach.

Marie started her career at McMaster University in 1985 with the Department of Obstetrics and Gynecology before moving on to work with Dr. Frank Baillie and Dr. James Bain in the Department of Surgery.

She accepted the position of Program Administrator for the Clinical Behavioural Sciences Program in the Department of Education Services at McMaster in 2002 before returning to the Department of Surgery in 2004 as Assistant Manager, Finance/AFP.

In 2009 she joined CMAS as Manager to leverage her skills in both management and administration.

Marie is a graduate of the Management Studies Program at McMaster University and is currently a student in the University’s part-time degree studies, Bachelor of Commerce Program.
The McMaster Industry Liaison Office (MILO) is charged with transferring the discoveries and knowledge created at McMaster University, St Joseph’s Healthcare and Hamilton Health Sciences to the private sector. MILO oversees the protection, commercialization, and licensing of new technology, as well as developing and negotiating collaborative research contracts between industry partners and university researchers. The office assists researchers in finding funding for technology commercialization and in developing funding proposals. In addition, MILO also provides space, support and services for students and faculty who are interested in developing their own start-up company or joint venture. Finally, MILO provides education sessions on intellectual property matters to researchers and students.

The McMaster Innovation Park

MILO works closely with the Centre for Surgical Invention & Innovation (CSii) to help the centre develop the commercial potential of its efforts. MILO supported the creation of the centre’s intellectual property assets through filing patents, searching for prior art, and arranging for trademarks. As well, MILO’s legal team provides advice and negotiation support for collaboration agreements between CSii and industrial partners. When CSii applies for commercialization funding MILO helps develop the grant proposal. Additionally, MILO has incorporated CSii’s work into its outreach activities, for example by highlighting CSii’s work at McMaster Innovation Showcase. As well, MILO has supported CSii’s outreach activities, such as Innovation Nation.
Dr. Elsie Quaite-Randall
Executive Director, McMaster Industry Liaison Office (MILO)

Dr. Elsie Quaite-Randall is the Executive Director of the McMaster Industry Liaison Office (MILO). In this role she is charged with transferring the discoveries and knowledge created at McMaster University, St Joseph’s Healthcare and Hamilton Health Sciences to the private sector. Her office oversees the protection, commercialization, and licensing of new technology, as well as developing and negotiating collaborative research contracts with industry partners. MILO also provides space, support and services for students and faculty with who are interested in developing their own start-up company or joint venture. She has played an active role in several spin off companies, including Accelyst, Adiga Life Sciences, ProFit HR, CPR glove and ProSensus and is on the board of several CECRs and collaborative networks. She also is the PI of the C4 network, a technology transfer community in SW Ontario. This group, funded at both the federal and provincial level works together to create a collaborative environment for technology transfer offices to share expertise, best practices and contacts creating an integrated approach to technology transfer in the region.

In addition to her executive director role, Elsie is also an adjunct associate professor in the Department of Biochemistry and Biomedical Science. One of her major teaching interests is to help science and technology students understand the intersection of business and science. She was recently awarded a grant from the Ministry of Economic Development in Ontario to host a one year course to teach students in the science, technology, engineering and math disciplines how to create a company based on their ideas.

Prior to joining McMaster University, Elsie was the Manager of IP commercialization in the Office of Technology Transfer (OTT) at Argonne National Laboratory in Chicago, Illinois, where she evaluated inventions made by researchers for their patentability and commercial potential. Elsie was responsible for identifying prospective partners both for research and development and commercialization opportunities. She played a major role in the creation of several new companies based on biosensor and biochip technologies, including Akonni Biosystems, Aurora Photonics and Safeguard Biosystems. Before joining OTT Elsie worked in the Legal department as an invention evaluator where she advised on the patentability of inventions reported at the lab and assisted with technical aspects of contract drafting. During this time she completed an MBA degree and was also admitted to practice before the US Patent and Trademark Office as a Patent Agent.

Before joining academic administration, Dr Quaite-Randall was an active researcher in the field of protein biochemistry, structural biology and molecular biology in New York and Illinois. Elsie, who is a native of Ireland, came to North America after a post-doctoral fellowship in Berlin, which was funded by several sources including the Royal Society (UK). She completed her undergraduate studies and received her PhD from the Queen’s University of Belfast, Northern Ireland.
Current areas of research include: cancer imaging, muscle function, cardiac functionality, and neuro-imaging, including functional MRI (fMRI), multinuclear spectroscopy, and multimodal imaging (fusion of MRI, PET/CT and near infrared spectroscopy (NIRS) with Ultrasound and/or EEG.)

The Imaging Research Centre (IRC) 3T MRI system is employed as the test bed for the Image Guided Autonomous Robot (IGAR). Engineering an advanced robot to work within the harsh MRI environment is a challenging task. Not only does the robot need to operate without error within the MRI, it also must not degrade the quality of the MR images. The scientists at the IRC are working closely with the engineers from MDA to test the individual components, as well as the assembled prototype robot. The performance of the various robot subsystems within the MRI, as well as the overall system accuracy is being evaluated. Equally important is the characterization of the MRI system performance with the robot present, and to minimize or eliminate any undesired effects that the robot may have on MR image fidelity.

**Key Individuals Involved in the Development of IGAR Robotic Technologies**

Collaboration with talented experts has provided the essential data, perspective and expertise to support the IGAR project and has been key to the progress made to date. CSii has partnered with local and international experts in the development of IGAR and will continue to seek input from clinicians; surgeons and engineers to ensure robotic tools are developed with the end users and their patients in mind.
Norman Konyer
Research Technician, Imaging Research Centre (IRC)

Norman Konyer designs, constructs and services specialty RF coils for both proton imaging and multinuclear spectroscopy and lends technical and MRI expertise to enable a wide variety of research projects.

He facilitates overall laboratory operation and maintenance of laboratory equipment and standards to ensure a state of good repair of ancillary equipment.

Norman analyzes data with available software and designs novel software applications as required.

He is tasked with managing the day-to-day activities of the MRI component of the imaging research centre and educates users about data acquisition; analysis, MR physics and RF coil design. He prepares original research findings for publication and presentation at international conferences.

Prior to joining St. Joseph’s Healthcare, he was a Research Physicist, Department of Imaging Research, at Sunnybrook Health Sciences Centre from 1996-2004 where he specialized in the design, construction and evaluation of RF coils for a variety of field strengths (0.2 to 3T) and purposes (cardiac phased array to micro-coils) and provided consultation and technical expertise to numerous research projects.

He managed a multi-user research laboratory and has extensive experience developing novel minimally invasive therapies, including: intra operative MRI, MR compatible infusion catheters, and interstitial and intravascular micro coils. He has implemented novel imaging protocols on whole-body research MRI systems and personally prepared original research findings for publication and presentation at numerous international conferences and was responsible for the maintenance of a NMR spectrometer.

Norm Konjer has a great deal of expertise on the interaction of RF coils in the MRI system - helping CSii to minimize the impact of our robotics on the effectiveness of the MRI imaging.
**BACKGROUND**

Technology in diagnostic imaging has advanced to the point that it is now possible to detect small, early stage breast cancers that were previously invisible to other imaging modalities. This is particularly true in the realm of Magnetic Resonance (MR) imaging, where higher magnetic fields (3 Tesla is rapidly becoming the new standard) and improved electronic detection systems, have dramatically improved diagnostic imagery with MR. In the case of breast imaging, MR imaging has been shown to detect certain cancers, such as early stage and diffuse cancers, that are undetectable to standard mammographic screening techniques, using X-rays or Ultrasound, especially in younger women or women with very dense breast tissue.

If an anomaly is detected by imaging the next step in the diagnostic process is to perform a biopsy, to extract a tissue sample for analysis. The importance of making an accurate tissue diagnosis of these early breast cancers is paramount. Minimally invasive diagnostic biopsy procedures, such as fine needle aspirations, core needle biopsies, and vacuum-assisted biopsies, have replaced many of the older surgical excisional biopsy methods. Smaller, early stage cancers, clearly need an accurate method to guided the minimally invasive biopsy device to its target.

However IGAR isn’t limited to biopsy procedures alone. The trend toward breast conservation therapy and breast preservation has elevated the importance of lumpectomy procedures. Minimally invasive nonsurgical radio-frequency ablation and cryoablation therapeutic procedures are now used for certain types of lesions and the increased accuracy that IGAR can provide is useful here as well.

**IGAR - The Breast Application**

**Early Detection and Treatment of Breast Cancer**

**FIGURE 1. The Image Guided Autonomous Robot (IGAR) Early Prototype**

An Elegant Solution

IGAR

IGAR: IMAGE GUIDED AUTONOMOUS ROBOT

CENTRE FOR SURGICAL INVENTION & INNOVATION
FIGURE 2. The Image Guided Autonomous Robot (IGAR) Early Prototype

FIGURE 3. IGAR Procedure rehearsal showing the robotic approach for breast biopsy. Physicians will be able to customize the specific path of the needle to avoid internal vasculature.
FIGURE 4.
IGAR Procedure rehearsal showing the robotic approach for breast biopsy. Physicians will be able to customize the specific path of the needle to avoid internal vasculature.
Milestones in IGAR Development

- Created a clinical advisory group to provide key clinician inputs into the project at a very early stage
- Developed an early prototype design to test and refine the initial design plans and joint structures of the robot
- Developed initial software tools to facilitate faster identification of areas of interest on the MRI scans, and assist the clinicians in biopsy and treatment path planning
- Analyzed the workflow of the current MRI Breast Biopsy and applied Lean processes to eliminate steps and maximize the efficiencies achieved by the IGAR Breast Robot
- Finalized the operational concept to prepare for one last round of joint testing and the final prototype stage
- Began the initial protocol design for the clinical trials scheduled to begin in Q2 2013
- Submitted 3 new patent applications
- Developed comprehensive 10 year business case for the IGAR Breast product, leading to the development of strategies to address funding gaps and further development activities
- Started 2 adjunct projects to address the desire for a better breast restraint system during the procedure and a better breast phantom for testing and training
- Continued to forge strategic partnerships to maximize our development, including new connections with Hologic and Sentinelle

IGAR & MRI at the Imaging Research Centre (IRC)

IGAR tested in the MRI at the Imaging Research Centre (IRC)
Pictured with Norman Koyner, from IRC and IGAR Project Manager, Kevin Randall
IGAR

The Image Guided Autonomous Robot (IGAR), figure 1, is the first robotic platform to be developed by CSii. Under the direction of Dr Dobranowski (clinical lead) and Dr Anvari (Scientific Director and CEO) CSii has collaborated with engineers from MDA and McMaster University to develop the first IGAR prototype for MR guided breast interventions. The design is based on input from a team of clinical experts that guided the key functionality, requiring 5 separate “degrees-of-freedom” which are necessary to steer an interventional device to it’s intended target. Patent protection for the design was filed in November 2010 (Reference to PCT application CA2010/001865).

Each of the five degrees of freedom requires a special piezo-electric drive systems (conventional electric motors, for example, cannot be used in MR), and due to the very confined space a novel gear drive system was developed. IGAR’s motion control system receives its commands from an IGAR workstation. Although driving IGAR to a target might sound easy, getting the robot to understand the position information it needs from the MR images (a process called “registration”) is not simple. Registration hardware (“fiducials”) and complex pattern recognition software had to be developed for IGAR, and has been extensively tested at the IRC.

The “Spider” prototype (figure 1) is made from ceramics, plastics and other non magnetic materials, that are safe to use in the MR. IGAR has undergone extensive testing in the 3 Tesla GE MR scanner at the Imaging Research Center at St Joseph’s Hospital. The environment in the MR scanner is very demanding: 30 KW rf fields, extremely strong static fields and oscillating “gradient fields” act in concert to induce strong forces on IGAR. By careful selection of materials and use of specialized piezo-ceramic drive systems IGAR operates flawlessly in the Scanner. Test data show that IGAR does not disturb the MR images, and most importantly a needle tip can be accurately and repeatably placed to a given position to within approximately 0.5 mm.

Software is a key element of any robotic system and the IGAR Graphics User Interface (GUI) has undergone extensive development. A series of patient MR image slices are transferred to the IGAR workstation, which displays the data in the three conventional radiological (2D) projections. Conventional (2D) radiological projections provide limited information for realizing the full 3D capabilities of the robotic system so a fourth, 3D, projection is generated by high speed graphics software and hardware (figure 2). The GUI allows an interventional procedure to be simulated or “rehearsed” and the 3D display can depict a “plane cut” image (figure 2) as the needle advances. The cutting plane clearly displays internal structure during the rehearsal, and the physician may choose an alternative path to target to avoid critical structures by reselecting the insertion point. We believe that the 3D visualization system will enhance trajectory planning and the rehearsal functionality will make it easier to avoid vasculature, and minimize patient trauma.

Now that the prototype concept has been validated work on the next phase has already begun. The next iteration in the IGAR design will incorporate a new type of geometry that will allow the use of more efficient “multi-channel” MR receiver coils. This will enable better MR images to be acquired in a shorter time than systems that are currently used for MR guided breast interventions. This improved design is will be used for clinical trials at three sites in North America.
KEVIN RANDALL
IGAR Project Manager, CSii

LIANNE STEFURAK
Executive Director, CSii

MICHAEL SCHMIDT
Program Manager, Development Programs

JAMES BOLGER
MDA, Director of Terrestrial Initiatives

ELIZABETH MARTIN
Director of Operations, CSii

At left: Side profile of the IGAR Prototype.
Collaborative Efforts: Partners and Networks

CSii is working closely with industry partners to develop clear commercialization plans for the IGAR technology and to accelerate both product launch and availability. Our growing list of partners include; MJ MacDonald Dettwiler and Associates (MDA), McMaster University and St. Joseph’s Healthcare Hamilton.

Partnerships with GE, Johnson & Johnson and Stryker as well as collaborations with the Robarts Centre, CPDC and the Schilling Clinic in Florida, have enabled us to remain on the cutting edge of tele-medicine, surgical and imaging innovations. These partnerships align us well with the new robotics and interventional platforms and provide access to market leadership in the sales and distribution of medical products that will help accelerate our progression into targeted markets.

Consultation with clinicians has been an essential part of the development of the IGAR Breast Application with input from multiple sources of exceptional leaders in the field of breast imaging.

CSii will continue to seek new opportunities in clinical and private sectors as well as other with other NCE CECRs, academic and corporate researchers and commercialization groups.

“We are very excited to be working with the professionals at CSii and feel that the leadership and medical expertise that Dr Anvari and his team provide will be a key element to MDA’s success in the medical field.”

James Bolger
MDA, Director of Terrestrial Initiatives

James Bolger has spent over 20 years in the design and development of high tech systems for application in space and consumer use. Specifically, James has had increasing leadership roles in the design and development of space robotics for human exploration since the early 1990’s, and is currently the director of terrestrial initiatives at MDA. This position is focused on applying MDA’s proven space robotics know how to new non-space applications – like medical robotics. James is a professional engineer with a BSc honours in mechanical engineering, and has numerous professional management affiliations.
“By applying research to identifiable needs the Centre is creating products that will enable surgeons (physicians) to deliver a higher standard of health care with image guided surgical robotics that will enable health care professionals to discover and treat diseases earlier while increasing the physician’s access and dexterity and limiting trauma to the patient.”

Rebecca Repa
Chair, Commercialization Committee CSii
President of St. Peter’s Hospital
Integrated Vice President of Laboratory Medicine and Diagnostic Imaging
Dr. Dobranowski’s involvement has provided input into the 3D imaging system that will enhance clinician experience, and ensure that the final IGAR interface provides significant improvements that made the identification, diagnosis, and treatment of cancer with MRI easier.

In addition to his commitments with the IGAR team, Dr. Dobranowski continues as Associate Clinical Professor of Diagnostic Imaging, McMaster University, Faculty of Health Sciences in Hamilton, Ontario, Canada, Director and Founder of the Centre of Radiological Anatomy, Provincial Medical Imaging Lead for Cancer Care Ontario, Chair of Ontario’s WaitTime Strategy Committee, National Chair, Canadian Association of Radiologists – Diagnostic Imaging Referral Guidelines 2010, and Diagnostic Imaging Lead for the Sisters of St. Joseph’s Outreach Programs in Uganda and Haiti. He remains an active member of the Medical Imaging Quality Council (MIQC), Hamilton Niagara Haldimand Brant Local Health Integration Network (LHIN).
Dr. Nathalie Duchesne
Princess Margaret Hospital
Assistant Professor
Head, Division of Breast Imaging

Dr. Nathalie Duchesne has worked in the area of breast imaging and intervention since 1996. Dr. Duchesne received her Medical Doctorate in 1990 and her Diagnostic Radiology postgraduate degree in 1995, both from University Laval, Quebec City. She has performed rotations in university hospitals both in Australia and The Netherlands, and worked on a fellowship program in interventional MRI and bone tumors at Harvard University. The latter was completed in breast imaging at the Universite de Montreal. She also holds a B.Sc. degree in Biology.

Dr. Duchesne's main clinical and research interests include breast biopsy tool development, the application of MR imaging to diagnosis and intervention as well as new types of breast imaging and cancer detection.

She is a pioneer in vacuum-assisted breast biopsy, having done many world and Canadian premieres for various devices. She is an internationally known speaker having given numerous national and international conferences, with a track record of publications in the areas of breast imaging and intervention. She has lectured in the Breast Imaging and Intervention Series (2001-2003).

She is a member of various international scientific societies, and has received many awards from her peers, such as the Young Radiologist Investigator Award of the Year for 2005 by the Canadian Association of Radiologists, and, more recently, the 2008 Personality of the Year in Radiology from the Société Canadienne-Francaise de Radiologie / Association des Radiologistes du Québec for her personality, scientific contribution, and humanitarian work.

Dr. Kathy Schilling
Medical Director
Breast Imaging and Intervention Centre for Breast Care
Boca Raton, Florida

Dr Kathy Schilling has played an active role in the review of IGAR performance capabilities over the past two years. As Medical Director of the Breast Imaging and Intervention Centre for Breast Care in Boca Raton, Florida, Dr. Schilling is well recognized as a leading clinician in the area of breast therapeutics.

Her experience in breast MRI, and understanding of unique patient sensitivities have provided the IGAR team with both process and market insight into the way IGAR will integrate into the clinical environment. The Boca Centre is one of the largest private clinics in North America, and will serve as a leading centre in the United States for the evaluation of the IGAR clinical system when it becomes available.
CENTRE FOR SURGICAL INVENTION & INNOVATION

THE TRANSFORMERS

- LASER BONE DRILLING PROJECT
- BREAST STABILIZATION PROJECT
- SEED LOCALIZATION PROJECT
THE TRANSFORMERS

CSii: SUPPORTING OUTSTANDING RESEARCH

CSii is working with Canadian and international researchers and actively seeking partnerships with Canadian inventors working on products in the research stage including; a seed localization project, a breast stabilization project and laser bone drill project.

SEED LOCALIZATION PROJECT

Dr Peter Lovrics
St Joseph’s Hospital & McMaster University

Although minimally invasive techniques are the preferred route for diagnosis, there are some cases where minimally invasive techniques cannot be used, and surgical removal is the only way to proceed. In cases where a lesion cannot be located by palpation (feeling of a physical “hard” lump) then the surgeon has to be guided to the correct location. This is typically done using very fine “hook wires” or “guide wires” that are placed using x-ray, ultrasound, or MRI directly prior to surgery.

Dr Peter Lovrics (Head of General Surgery at St. Joseph’s) is leading a clinical trial of a new technique called seed localization where a very small radioactive “seed” (smaller than a grain of rice) is placed near the area of interest prior to surgery (see Figure 1). In the operating theatre Dr Lovrics can locate the seed using a radioactive detector, and hence identify the exact location of the lesion, which can be removed with greater accuracy than the conventional hook-wire procedure. This has been proven to greatly reduce the possibility of follow up surgery. It also allows the surgeon greater flexibility in their angle of approach to access the tumor and can result in a smaller sample needing to be taken (allowing better cosmesis).

With IGAR we have the ability to take the next step and use MRI guidance to place the seed in certain types of cancer that are invisible to ultrasound and x-ray mammography. We believe this will play a vital role for surgical guidance in excisional biopsy and breast conserving lumpectomy procedures.
Dr. Alexandru Patriciu
Associate Professor

Dr. Alexandru Patriciu is an assistant professor of Electrical and Computer Engineering at McMaster University and is a member of the McMaster School of Biomedical Engineering.

His research interests include robotics, medical robotics, automatic deformable objects/soft tissue manipulation, mechatronics.

Prior to joining McMaster in 2007, Dr. Patriciu was a staff scientist with the National Institutes of Health, Bethesda, Maryland and a postdoctoral fellow with the Brady Urological Institute at The Johns Hopkins Medical Institutions, Baltimore, Maryland. He earned a PhD in Mechanical Engineering from The Johns Hopkins University.

Dr. Patriciu was involved in the development of several robots for image-guided interventions.

Shahin Sirouspour
Associate Professor

Shahin Sirouspour is an associate professor in the department of electrical and computer engineering at McMaster University.

His research interests include teleoperation control, haptics, robot-assisted medical intervention, advanced robot controls, machine vision, and medical image processing.

Dr. Sirouspour received the McMaster President’s Award of Excellence in Graduate Supervision in 2008. He is a registered Professional Engineer in the province of Ontario.

BREAST STABILIZATION PROJECT
Dr. Alexandru Patriciu & Dr. Shahin Sirouspour
McMaster University

Image guided (X-ray or MR) breast interventions, such as biopsy, require breast tissue to be fixed so the biopsy needle can reach the cancerous lesion without pushing it out of the way. This is usually done by applying quite high clamping forces that can be uncomfortable or painful to the patient. This also may restrict blood flow and potentially reduce the access of contrast agent that is used in MR to identify the cancerous regions.

In the breast stabilization project, Dr’s Patriciu and Sirouspour have developed computer models to simulate the forces that exist in breast tissue as a biopsy needle is inserted. They were then able to optimize the design of a system that uses almost no clamping force but keeps the lesion in a location where it will be penetrated by the biopsy needle.

Finally they verified that a constructed prototype behaves as predicted in the computer simulations. Now, their system is able to stabilize the breast tissue so that the biopsy needle accurately reaches its target.

In the next iteration a system optimized for use with the IGAR system will be developed, which will improve patient comfort during the procedure.
LASER BONE DRILLING PROJECT
Dr Qiying Fang & Dr Greg Wohl
McMaster University

The bone drilling project started with a project by Dr’s Anvari, Fang and Wohl together with MDA to create an image guided bone drilling platform using a conventional mechanical bone drilling system (see Figure 3). Bone drilling requires high accuracy to stabilize the spine in the case of fracture, tumour, or spondylodiscitis. This is a very difficult procedure that requires accuracy of about one mm or less and may benefit from the highly precise placement that IGAR brings to the table.

Dr. Qiying Fang
Associate Professor
Dr. Fang’s current research interests include steady state and time-resolved fluorescence spectroscopy/imaging for biomedical applications, e.g. optical biopsy, wide-field imaging, endoscopy and microscopy; therapeutic applications of lasers in medicine; and technologies leading to miniaturization of optical instruments/components.

Prior to joining McMaster, Dr. Fang was a research scientist in the Minimally Invasive Surgical Technology Institute at the Cedars-Sinai Medical Center in Los Angeles. Dr. Fang obtained his MSc in Applied Physics and PhD in Biomedical Physics from the East Carolina University, where he studied pulsed laser interaction with soft biological tissue. He obtained his Bachelor’s degree in Physics from Nankai University.

Dr. Fang is a member of American Society of Photobiology (APS), American Physical Society (APS), American Society for Lasers in Medicine and Surgery (ASLMS), Optical Society of American (OSA), Institute of Electrical and Electronics Engineers (IEEE), the International Society for Optical Engineering (SPIE) and the Phi Kappa Phi Honor Society.

Figure 3. A CMAS, McMaster, MDA evaluation platform successfully demonstrated the required accuracy for spinal bone drilling for the pedicle screw surgical procedure (using a mechanical drill)

Dr. Gregory Wohl
Assistant Professor
Dr. Gregory Wohl is an assistant professor of Mechanical Engineering at McMaster University and is a member of the McMaster School of Biomedical Engineering. Dr. Wohl’s research interests include biomechanics of musculoskeletal systems, bone adaptation to mechanical stimuli and injury, and interface behaviour between tissues and surgical instruments in minimally invasive surgery and surgical robotics.

Prior to joining McMaster in 2007, Dr. Wohl was a post-doctoral fellow and senior scientist in the Department of Orthopaedic Surgery at Washington University in St. Louis where he studied molecular biology of bone repair to fatigue injury; and a post-doctoral fellow in the Department of Chemical and Materials Engineering at the University of Alberta where he studied the influence of parathyroid hormone on the mechanical properties of newly formed bone. Dr. Wohl received his MSc and PhD in Mechanical and Manufacturing Engineering at the University of Calgary where he studied the effects of high fat diet on bone mechanical properties and the effects of freezing storage on the incorporation of bone and cartilage grafts for surgical joint repair. He received his Bachelor of Science in Mechanical Engineering with a Minor in Manufacturing from the University of Calgary.

Dr. Wohl is a member of Canadian Society for Biomechanics (CSB), International Society of Biomechanics (ISB), Society of Automotive Engineers (SAE), and Orthopaedic Research Society (ORS), and a licensed member of the Professional Engineers of Ontario (PEO).
This project explores the possibility of integrating ultra-fast laser ablation with image-guided robotic technology for the purpose of precise bone tissue removal. Specifically, the project involves the investigation of different laser ablation protocols and their effect on the efficiency and accuracy of bone removal.

The aging population poses a number of challenges to health professionals. As a result, it is expected that the number of patients requiring the insertion of spinal stabilizing/supporting rods will increase. These external supports are needed for patients who suffer from degenerative disc disease, fractures, or spinal deformities, and are connected to adjacent healthy vertebrae with trans-pedicular screws. Pedicle screw insertion is challenging as the pedicle itself consists of only a narrow passage of bone into which screws need to be inserted. If a screw is misplaced, it may injure the spinal nerves around the pedicle or the vessels or soft tissues in front of the vertebral body. Using the conventional approach of bur hole drilling and screw threading under intra-operative x-ray guidance, a randomized controlled study revealed an incidence of 13.4% for ill-placed screws. Robot-guided pedicle screw placement has been previously shown to be a reliable tool for more exact screw placement. Moreover, by using a laser for bone removal, the undesirable mechanical stresses induced by conventional drilling could be avoided. Ultrashort pulsed laser ablation has been shown to result in significant material volume removal while maintaining minimal collateral damage advantages. In addition, laser ablation has several potential advantages over mechanical drills used in orthopaedics such as no mechanical vibration, non-contact intervention, intricate cut geometry, and hemostatic and aseptic effects.
Innovation Nation

CONFERENCE & ROBOTICS COMPETITION

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Speakers, guests and sponsors gathered to talk about ideas, showcase their research and inventions, share their experiences and forecast their visions of the future. The gathering of scientists, researchers, surgeons, academics and students was an exciting mixture of individuals passionate about their journey or discovery and committed to expanding their potential.

Innovation Nation focused on outstanding innovations in science, medicine and engineering from both current and future perspectives. The intention was to facilitate the exchange of ideas and concepts that will help inspire the creation of a new generation of innovative products, solutions and scientific endeavours. The conference showcased the work of innovators who are presently redefining our world and redesigning the way we do things.

Innovators and guests enjoyed the opportunity to network with industry experts, peers and members of academia and to mingle and interact with student innovators seeking the opportunity to follow in their footsteps. Student outreach was a major focus of the event.

Day two of the Conference featured a Robotics Competition designed to create a forum where university and high school students could present their robotic innovations to a panel of prestigious industry experts for the opportunity to win prizes and capture the attention of some of the leading innovators in their field.

The young Canadian teams made an impressive showing with the work they produced, their competitive spirit and passion for science. Canadian innovation is changing the world, changing the way we view ourselves and the way in which we view our potential to find solutions to social, medical and environmental conditions as they emerge. Innovation strengthens our economy, creates jobs and enhances our reputation as a world leader in technology, healthcare and economic pursuits.

CSii’s goal of cultivating and unleashing innovative potential will help to build a stronger Canada and one day have a global impact. The world needs more of what our Canadian innovators have to offer!
Mr. Alvarez is a leader in Canadian health care. He is known for taking on challenging mandates and building successful organizations.

As President and Chief Executive Officer of Canada Health Infoway, he has been a catalyst for accelerating the development of electronic health records in Canada. He has established strong, collaborative relationships with the federal, provincial and territorial governments and other stakeholders as the foundation for solid progress. He has articulated a broad national vision for reforming Canada’s health care system through innovation and technology. On the international front, he has helped to position Canada as a world leader in health care renewal.

Mr. Alvarez recently earned the Institute of Corporate Directors certification at the Rotman School of Management. In 2007 he was recognized as the 2007 National Builder Inductee to the Canadian Information Productivity Awards (CIPA) Hall of Fame for the leadership he has exercised throughout his career (with the Government of Alberta, the Canadian Institute for Health Information and at Infoway) in promoting the application of innovative technology to improve health care delivery for Canadians.

Prior to his role at Infoway, Mr. Alvarez also played a key role in harnessing the power of information to improve health care. As former president and chief executive officer and ex-officio board member of the Canadian Institute for Health Information (CIHI), he helped CIHI evolve into a well-known and respected organization with strong ties to the research community.

Mr. Alvarez is past chair of the National Health Information Council. He is a frequent speaker and facilitator at national and international health care conferences and is a past recipient of the Who’s Who in Healthcare Award. He is an honorary fellow of the e-Health Research Centre’s (EHRC) Advisory Committee of Australia, and a member of the Advisory Council of the Identity, Privacy and Security Initiative at the University of Toronto.

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The recipient of the 2009-2010 ORION Award for Leadership, Dr. Anvari has also been awarded the Government of Ontario Diamond Award for Innovation in Technology, the Government of Canada Gold Medal of Distinction for Telerobotic Surgery and the McMaster Innovator of the Year Award (2009).

Dr. Anvari was one of the first surgeons in Canada to use robotics in surgery, and in 2003 he established the world’s first telerobotic surgical service linking St. Joseph’s Healthcare Hamilton and a community hospital, North Bay General. He was the chief scientific officer for the NEEMO 7 mission (2004), and NEEMO 9 (2006), joint projects of McMaster, the Canadian Space Agency and NASA that were tasked with testing the ability of new robotic and telesurgical technology to allow a non-physician to perform assisted surgery in a contained environment that simulates conditions in space.

Dr. Noseworthy has focused his research on the assessment of normal and diseased tissue microstructure, and the ensuing modulation of tissue metabolism, using magnetic resonance imaging (MRI) and in vivo nuclear magnetic resonance (NMR) spectroscopy. He is interested in developing more comprehensive and diagnostically useful tissue evaluation protocols including both anatomic as well as functional information.

He is currently a MRI Physicist in the Department of Diagnostic Imaging, St. Joseph’s Healthcare, Hamilton and Adjunct Professor, Department of Medical Imaging, at the University of Toronto.

Dr. Noseworthy is the Co-Director, McMaster School of Biomedical Engineering, Associate Professor, with the Department of Electrical and Computer Engineering, the Faculty of Engineering, an Associate Member of the Department of Medical Physics and Applied Radiation Sciences, Faculty of Science, Associate Member, Department of Psychiatry and Behavioural Neurosciences, Faculty of Health Sciences and an Associate Member of the Department of Radiology with the Faculty of Health Sciences.

Credentialed as Special Professional Staff, St. Joseph’s Healthcare, since 2003, Dr. Noseworthy is a P.Eng. (Limited License with Professional Engineers of Ontario, PEO) since August 2009.

He is Adjunct Professor, Department of Clinical Studies, Ontario Veterinary College at the University of Guelph.
Aaron Fenster, PhD, FCCPM
Canada Research Chair-Tier 1 in Biomedical Engineering

Dr. Fenster received his PhD degree in 1976 from the Department of Medical Biophysics of the University of Toronto. His first academic appointment was at the Department of Radiology and Medical Biophysics of the University of Toronto from 1979 to 1987, and the Director of the Radiological Research laboratories of the Department of Radiology.

In 1987 he became Scientist and founding Director of the Imaging Research Laboratories (IRL) at the Robarts Research Institute and Professor at The University of Western Ontario (UWO) in Radiology and Medical Biophysics. In addition to his leadership at the Robarts, he is the founder and Associate Director of new interdisciplinary graduate Program at UWO in Biomedical Engineering, combining strengths of basic scientists, engineers and clinician scientists in three faculties (Medicine & Dentistry, Engineering and Health Sciences). He is also the Chair of the basic Science Division of the Department of Medical Imaging at UWO.

Currently, he holds a Canada Research Chair-Tier 1 in Biomedical Engineering and he is the recipient of the 2007 Premier’s Award for Innovative Leadership.

Fenster’s group has focused on the development of 3D ultrasound imaging with diagnostic and surgical/therapeutic cancer applications in humans as well as mouse research models. His team developed the world’s firsts in 3D ultrasound imaging of the carotids and prostate, 3D ultrasound guided prostate cryosurgery and brachytherapy, 3D ultrasound guided prostate and breast biopsy for early diagnosis of cancer and 3D ultrasound images of mouse tumours and their vasculature.

Fenster’s research has resulted in 34 patents (25 awarded and 9 pending) and the formation of two companies in London (Life Imaging Systems and Enhanced Vision Systems), with Fenster as a founding scientist. In addition, some of his patents have been licensed to 11 different companies, which have commercialized them for world-wide distribution.

Greg Baiden, PhD, MSc, BSc
Chairman & Chief Technology Officer of Penguin Automated Systems Inc.

Dr. Greg Baiden is the Chairman and Chief Technology Officer of Penguin Automated Systems Inc., a leading research, development and prototyping company specializing in business technology strategies that concentrate on mobile robotics for a number of industries.

Dr. Baiden holds a PhD in Mining Engineering with a speciality in technology and economics; he is also a Professor in the School of Engineering at Laurentian University, where his teachings focus on Mining and Automation Robotics. In 2001, he was awarded the prestigious Canadian Research Chair in Robotics and Mine Automation. Dr. Baiden is well published and holds a number of patents in mining automation systems including robotic positioning systems for applications in open pit, underground, subsea and in space environments.

From 1986-2001, Dr. Baiden was a member of Inco Limited’s Senior Management Team where he assumed responsibility for all corporate mining research. The mining research work at Inco Limited included pioneering telerobotic systems within the company and around the world. This telerobotic work lead to the conceptualization and implementation of the world’s first robotic mine prototype at the 175 Ore Body. One of his roles included being the President of Automated Mining Systems, a spin-off of Inco Limited, specializing in communications and control systems for future mine production technology.

Dr. Baiden has served on numerous Boards of Directors including the Precarn, Greater Sudbury Development Corporation and the Art Gallery of Sudbury; he is recognized by his peers in the mining industry by several associated awards.

Michael Parfitt
Director, Medical Robotics at MacDonald Dettwiler Space & Advanced Robotics Ltd (MDA Robotics)
Formerly the sole proprietor of Hawarden Surgical Robotics, Michael Parfitt is the current Director of Medical Robotics at MacDonald Dettwiler, Space and Advanced Robotics Ltd (MDA Robotics).

Prior to his current position, Michael Parfitt has enjoyed a distinguished career with MacDonald Dettwiler and Associates (MDA) as the former Program Director of the International Space Station, Robotics covering both the Canadian Space Agency (CSA) and NASA for 12 years.

In addition, throughout his time with MDA, his experience includes; two years as Director of Operations, three years as the Director of Safety and Product Assurance at MDA covering the CANADARM Program for NASA, and eight years as Manager of Manufacturing and Quality Engineering covering Strategic Weapon Systems.

With a diverse portfolio of experience in the field of aeronautical engineering, before joining MDA, Mr. Parfitt’s experience in the industry includes six years as Production Engineer at Pratt & Whitney Jet Engines and five years as an Aeronautical Apprentice at De Havilland Aircraft.
Dr. Santiago Horgan, Chief of Minimally Invasive Surgery at UC San Diego Medical Center, is an internationally recognized expert in robot-assisted surgery and a pioneer in the surgical treatment of morbid obesity as well as a specialist in surgery and physiology of the esophagus. Dr. Horgan is a pioneer in the emerging field of Natural Orifice Transluminal Surgery (NOTES), in which surgical instruments are passed through a natural orifice such as the mouth to reach the desired organ. By avoiding major incisions, the NOTES procedure can provide patients with a faster recovery time and virtually no scarring.

As the director of UCSD’s Center for the Future of Surgery, Dr. Horgan is working with colleagues to advance these scarless techniques by investigating, developing, testing, and teaching procedures that will revolutionize the field of surgery. To date, he has performed more than 60 NOTES procedures and is involved in continuing clinical trials. Before he joined the UCSD Department of Surgery as Professor of Clinical Surgery in 2006, Dr. Horgan was Director of the Minimally Invasive Surgery and Robotic Surgery Department and Co-Director of the Swallowing Center at the University of Illinois at Chicago. He was also Director of the Minimally Invasive Bariatric Center in Chicago.

Ken Dobler is Worldwide Vice President of Franchise Development for Ethicon Endo-Surgery and a member of the Global Management Board. In this role, Ken is responsible for Franchise Development, concept and feasibility teams, Market Creation and Development, pilot teams investigating opportunities outside EES’s business model, Strategic Planning and Business Development. The VP of Clinical/Pre-clinical Research and Regulatory Affairs is also a member of this team.

In his previous position as Vice President of International Development for Ethicon Endo-Surgery, Ken and his team worked closely with the company’s leadership in Asia, Latin America, Japan and Canada to increase global capabilities and growth. Ken joined Johnson & Johnson in December 1983 as a sales representative for Ethicon, Inc., and continued in sales and leadership positions there for eight years. Upon joining Ethicon Endo-Surgery in 1991, Ken played a significant role in the company’s growth through leadership positions in Sales and Business Development, Licensing and Acquisitions, and Strategic Planning.

Ken earned a Bachelor of Science degree in business administration from Catawba College.

Eileen McMahon practices exclusively in the areas of intellectual property and food and drug regulatory law. She is one of a handful of Canadian lawyers who advise on regulatory clearance and intellectual property protection of products. Eileen is a registered patent and trademark agent in the United States and Canada.

Eileen’s experience includes strategic advice on identifying intellectual property and regulatory assets; obtaining and maintaining market exclusivity using intellectual property and regulatory laws; exploiting intellectual property assets; and enforcing intellectual property rights.

Richard Satava, MD, FACS, is Professor of Surgery at the University of Washington Medical Center, and Senior Science Advisor at the US Army Medical Research and Materiel Command in Ft. Detrick, MD. Prior positions include Professor of Surgery at Yale University and a military appointment as Professor of Surgery (USUHS) in the Army Medical Corps assigned to General Surgery at Walter Reed Army Medical Center and Program Manager of Advanced Biomedical Technology at the Defense Advanced Research Projects Agency (DARPA).

His undergraduate training was at Johns Hopkins University, medical school at Hahnemann University of Philadelphia, internship at the Cleveland Clinic, surgical residency at the Mayo Clinic, and a fellowship with a Master of Surgical Research at Mayo Clinic. He has been continuously active in surgical education and surgical research, with more than 200 publications and book chapters in diverse areas of advanced surgical technology, including Surgery in the Space Environment, Video and 3-D imaging, Telepresence Surgery, Virtual Reality Surgical Simulation, and Objective Assessment of Surgical Competence and Training.

During his 23 years of military surgery he has been an active flight surgeon, an Army astronaut candidate, MASH surgeon for the Grenada Invasion, and a hospital commander during Desert Storm, all the while continuing clinical surgical practice.
The spirited CSii robotics competition was well received by students, judges and conference guests alike. Guest speakers, sponsors, scientists and academics mingled with students reviewing the innovation showcase, asking questions and chatting with the teams.

It was an opportunity for students to network and to have access to leaders in robotic industry and innovation with the hope that the mentoring and inspiration would lead these students to follow their passions and advance their fields in the future, becoming outstanding Canadian inventors.

The audience was thoroughly engaged and entertained as the university and high school students participating in the robotics competition made their presentations. The entries were judged on their design, uniqueness, creativity, functionality, and practicality, ease of use and market viability.
ROBOTIC COMPETITION • The Winning Teams

PLATINUM AWARD
OAKVILLE TRAFALGAR HIGH SCHOOL
Presented by Judges: Santiago Horgan, Eileen McMahon,
Dr. Michael Noseworthy and Chris Woodland
Team Members: Nick Whittaker, Nick Bandiera, Eric Atkinson, Evelyn Wainewright
The Oakville Trafalgar High School robot HANK (Harbinger of A New Kool),
was selected for its commercial possibilities and potential use in a hospital or
warehouse setting. In a hospital the robot could be used to transport supplies
and linens as well as hazardous materials such as radioactive isotopes.

UNIVERSITY AWARD
LAURENTIAN UNIVERSITY
Presented by Judge: Dr. Michael Noseworthy
Laurentian Team Representative: Gregory Lakanen
Laurentian University, Sudbury. Laurentian’s robot, "Lunabot", is designed
for mining on the moon and won NASA’s lunabotics competition in May.

HIGH SCHOOL AWARD
ABBY PARK HIGH SCHOOL
Presented by Judge: Eileen McMahon
Team Members: Garnet Mason and Vad Kluev
Abby Park High School, Oakville designed
a sonic guide wand for individuals who
are visually impaired.
The CSii Bariatric Registry Project has helped to demonstrate the commitment of the centre to innovate not only in terms of technical solutions, but also in addressing patient access to surgical care.

As part of the Ontario Bariatric Network’s Obesity initiative, CSii manages and administers the Bariatric Registry Project.

**PHASE ONE: CREATION OF STANDARDIZED CENTRALIZED REFERRAL PROCESS**

2010 was a transitional year for obesity management throughout the province. The management of obesity treatment continues to reflect a significant rise in the obese population provincially. As of January 1, 2011 the Ministry created a mandate that surgical referrals for the treatment of bariatrics be routed to ministry funded programs at the newly created Bariatric Centres of Excellence and Regional Assessment and Treatment Centres for initial assessment. In its infancy, these bariatric centres initially managed their own referral process and clinicians had to make arrangements with individual centres for the patient to receive care.

The formation of a new centralized referral process ensured patient privacy and established a process around how patients would enter the program, be evaluated as eligible candidates, and be routed to the Centre of Excellence that is most capable of providing the patient with a successful and timely outcome, regardless of their geographic location. The successful execution of this referral portal represented the first significant achievement for the Bariatric Registry project.
This process, which has been active since October 8, 2010, has ensured that all patients receive the same level of consideration and attention, while helping to make certain that the centres operate at optimal intake to minimize patient wait times and virtually eliminate the need for out of country care. It also ensures that a record of the patient is easily available for validation of patient status. CSii has worked closely in partnership with the Population Health Research Institute (PHRI) in establishing this new system and managing the workload associated with incoming physician requests so that clinicians can better focus on delivery of patient care.

As of June 2011, the Bariatric Registry Referral Portal showed over 9,000 new Bariatric Referrals in its system. Each referral has been distributed to one of seven Bariatric Centres of Excellence and Regional Assessment Treatment Centres based on the geographical location and centre capacity. Of those 9,000 Referrals in the system, the average Body Mass Index (BMI) is 48.23 with females making up 72% of the patients seeking treatment. The question remains, is there a larger male obese population not yet ready to take the steps to seek bariatric care? Of the reported referrals in our system, most of them fall with the 35–55 age range. Establishing the referral process has been an important step toward the establishment of standardized reporting and patient treatment pathways for all centres in Ontario.

PHASE TWO:
COLLECT AND EVALUATE TREATMENT AND OUTCOME DATA

To evaluate trends in bariatric care pathways and care outcomes, the second phase of the project has been the collection of deidentified patient care information to develop evidence-based information regarding risks and benefits of bariatric surgery, as well as tracking outcomes.

Data collection is currently underway at all seven centres. This data will allow the ministry and other decision makers to better understand the effects and outcomes of different bariatric treatments on the diverse patient populations. Data will be collected over a two year period of time, documenting the treatment a patient receives following a referral for bariatric treatment. Within the coming year, we anticipate that this data will give a formative look into the etiology, management, efficiency, and economics of health outcomes related to obesity.

The results generated will enable decision makers to evaluate risks and strategies associated with the provision of bariatric care in Canada. The creation of new Canadian based standards of care to help maximize patient outcomes and optimize the cost of care will be a key benefit resulting from this data collection.
ONTARIO BARIATRIC CENTRES OF EXCELLENCE

The Bariatric Centres of Excellence (BCoE) and the Regional Assessment Treatment Centre (RATC) are organizations with a team of experts promoting the collaboration and use of best practices around the care of people suffering with obesity and obesity related diseases. Their focus is on improving health by decreasing the cardiovascular risk factors such as high blood pressure and diabetes. They act as a resource for improving the patient’s knowledge base enabling them to implement strategies to deal with their obesity and providing the means for the patient to access both surgical and non-surgical care.

BCoE’s provide both surgical and non-surgical treatment of bariatric patients onsite. The RATC does not offer surgery and is focused on the pre and post op care of the patient, partnering with a BCoE to provide the actual surgery. Many RATC’s are co-located near to a Bariatric Centres of Excellence. The RATC’s allow for patients to have better access to the longer term follow up care local to their geography.

There are four Bariatric Centres of Excellence (BCoE) in Ontario and 3 Regional Assessment and Treatment Centres (RATC).

FOUR Bariatric Centres of Excellence (BCoE):
1. Hamilton Bariatric Centre of Excellence:
   St. Joseph’s Healthcare Hamilton
   Hamilton Health Sciences Centre (Medical Site)
2. University of Toronto Collaborative Bariatric Surgery Program:
   Humber River Regional Hospital
   Toronto East General Hospital
   St. Michael’s Hospital
   St. Joseph’s Health Centre
   The Hospital for Sick Children
   University Health Network’s (Toronto Western Hospital)
3. Ottawa Bariatric Centre of Excellence
4. Guelph Bariatric Centre of Excellence

FOUR Regional Assessment and Treatment Centres (RATC):
1. Windsor Regional Hospital
2. Thunder Bay Regional Hospital
3. Sudbury Regional Hospital
4. Kingston Hotel Dieu Hospital (due to open March 2012)

TWO Pediatric Regional Assessment and Treatment Centres (PRATC):
1. Children’s Hospital of Eastern Ontario (CHEO)
2. Hospital for Sick Children (STOMP Program)
MILESTONES:  
THE BARIATRIC REGISTRY PROJECT

Creation and Implementation of a Standardized Referral Process (and Referral Portal) to provide key information to the centres, eliminate costly duplication and minimize wait times and travel times for new referrals. This process went live October 2010. The total number of referrals through the Referral Portal from inception to the end of December 2011 is 14,255. Currently we receive over 600 new referrals a month into the system.

Creation and Implementation of the online Bariatric Registry Patient Database and data collection processes that will facilitate the gathering of anonymous treatment data from consenting bariatric patients. This data will be used to better understand the factors affecting treatment and positive outcomes.

Launch the Patient Database at St Joseph’s Healthcare Hamilton (a partner of CSii) as the first pilot site in early 2011. Data collection has been initiated at all 7 centres in the 2011 year, and at the close of 2011 data from 2147 anonymous patients has been logged into the system.

Established a communication team with members from 7 Bariatric Centres with the purpose of providing a more streamlined system for patient transfers and process adjustments to ultimately improve the patient experience. This group also offers feedback to CSii on how we can better improve the Bariatric Registry data collection.

Developed a project website (www.bariatricregistry.ca) and Bariatric Hotline phone number to keep the various stakeholders informed and troubleshoot any technical issues.

RESULTS TO DATE

The bariatric registry project, paired with other OBN initiatives has already significantly reduced overall wait times for Bariatric Surgery in Ontario. Some sites have seen wait times cut in half.

Over 20% of waiting referrals in the system since 2009 have been identified as duplicates and eliminated.

As of December 31, 2011 there were 14,255 referrals in the Referral Portal directed to the appropriate centre based on their Postal Code. This number has almost tripled since December 31, 2010 when there was a reported, 5,824 referrals highlighting a real need for the program and the evidence-based data being collecting to improve patient care.

As of December 31, 2011 there were 2147 patients logged into the research database, reflecting significant trending in this population.

At the newest centre: Sudbury Regional Assessment Treatment Centre at the Sudbury Regional Hospital, the clinic is now open and was accepting referrals as of the end of October 2011.

LOOKING FORWARD

There is a new RATC scheduled for opening in 2012: Hotel Dieu Hospital, in Kingston, is scheduled to open their clinic doors March of 2012 for new patients. The addition of the new centre, will assist in balancing referral wait times and provide more convenient patient care for those in Kingston and surrounding areas.
BARIATRIC CENTRES OF EXCELLENCE
AT ST. JOSEPH’S
HEALTHCARE HAMILTON

St. Joseph’s Healthcare is a strong partner of CSii and was designated the pilot site of the Bariatric Registry – Data Collection. The Centre played a lead role in the development of the data collection forms and processes and allowed them to be implemented first at their site in order to ensure that the collection process was running smoothly prior to rolling it out to other sites.

The Bariatric Program at St. Joseph’s began in January 2009 as an integrated surgical program for the care of obese and morbidly obese patients. In the first year over 140 surgeries were performed. The program plans to expand to 450 surgeries in 2011. Currently funded by the Ministry of Health to perform the Roux-en-Y Gastric Bypass and the Gastric Sleeve the Centre also collaborates with the Hamilton Health Sciences Medical Program to help people who are not candidates for surgery or choose not to have surgery, achieve weight loss in other ways.

The St. Joseph’s Centre has established telemedicine links with northern Ontario to assist with assessment and follow-up in remote sites.

THE TEAM

The St. Joseph’s bariatric health care team consists of Surgeons (Dr. Mehran Anvari and Dr. Dennis Hong), General Internal Medicine Physicians, Nurses, Social Worker, Pharmacist, Dietitians, Psychiatrist, and Administrative Clerks. The team meets weekly to plan programs offered, review cases, create education resources and ensure standards of care are being met.
Dr. Dennis Hong  
Physician, Department of Surgery

Dr. Hong is highly skilled in minimal access surgical techniques and regularly performs a variety of laparoscopic procedures, however, 75% of his practice is currently focused on bariatric surgery.

Dr. Hong has occupied staff positions with outstanding facilities in Canada and the United States including:

> The Good Samaritan Hospital,  
  Bariatric Surgery Program, Department of Surgery,  
  Portland, OR, Staff (2004-2007)
> Providence Portland Medical Center,  
  Department of Surgery, Portland, OR,  
  Staff (2004-2007)
> Southwest Medical Center  
  Weight Loss Surgery Program, Vancouver, WA,  
  Staff (Jan 2007-Apr 2007)
“As we complete our second full year of operation, our confidence remains high that we have the resources to complete our Programs. We are well-financed to develop our projects going forward, and KPMG, with their knowledge and expertise, have worked closely with us to ensure that our reporting obligations are properly followed in a timely fashion.”
## CSii – STATEMENT OF FINANCIAL POSITION – Year 2
April 1, 2010 / March 31, 2011

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2010</th>
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<tbody>
<tr>
<td><strong>ASSETS:</strong></td>
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<tr>
<td><strong>Current assets:</strong></td>
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<tr>
<td>Cash and cash equivalents</td>
<td>$520,417</td>
<td>$798,269</td>
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<tr>
<td>Short-term investments (note 3)</td>
<td>4,780,911</td>
<td>2,535,779</td>
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<td>Accounts receivable (note 6)</td>
<td>183,378</td>
<td>40,219</td>
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<td>Prepaid expenses</td>
<td>46,559</td>
<td>310</td>
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<td>Sales tax receivable</td>
<td>45,461</td>
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<td><strong>Total current assets</strong></td>
<td>$5,576,726</td>
<td>$3,381,351</td>
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<td><strong>Long-term investments (note 3)</strong></td>
<td>7,693,984</td>
<td>10,936,263</td>
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<td><strong>Capital assets (note 4)</strong></td>
<td>5,381</td>
<td>4,757</td>
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<td><strong>Intangible assets (note 5)</strong></td>
<td>1,215,020</td>
<td>225,536</td>
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<tr>
<td><strong>Total assets</strong></td>
<td>$14,491,111</td>
<td>$14,547,907</td>
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| **LIABILITIES AND NET ASSETS** |        |        |
| Comprised of:                  |        |        |
| Accounts payable and accrued liabilities | $113,188 | $55,809 |
| Deferred revenue (note 2) | 9,492,204 | 12,214,125 |
| **Net assets:** |      |        |
| Networks of Centres of Excellence | 4,513,165 | 2,209,022 |
| Non-Networks of Centres of Excellence | 303,603 | 68,951 |
| **Total net assets** | $4,885,719 | $2,277,973 |
| **Total liabilities and net assets** | $14,491,111 | $14,547,907 |

Year ended March 31, 2011 with comparative figures for 2010
# CSii – STATEMENT OF OPERATIONS – Year 2
April 1, 2010 / March 31, 2011

Year ended March 31, 2011, with comparative figures for period February 25, 2009 to March 31, 2010

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<tr>
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<tr>
<td><strong>REVENUES:</strong></td>
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<tr>
<td>Networks of Centres of Excellence grant (note 2)</td>
<td>$2,883,781</td>
<td>$2,590,875</td>
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<td>Bariatric registry (note 2)</td>
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<td>32,083</td>
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<td>Interest income</td>
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<td>Ontario Bariatric Network (note 6)</td>
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<td>45,308</td>
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<tr>
<td>McMaster University grant (note 6)</td>
<td>60,000</td>
<td>60,000</td>
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<td>ValenTX study funding</td>
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<tr>
<td>Other income</td>
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<td><strong>Total Revenues</strong></td>
<td>3,640,576</td>
<td>2,850,611</td>
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<td><strong>EXPENSES:</strong></td>
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<td>Salaries and benefits</td>
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<td>Scientific director stipend</td>
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<td>Bariatric registry</td>
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<td>General and office</td>
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<td>Research grants</td>
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<td>Conferences and meetings</td>
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<td>Insurance</td>
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<td>Amortization</td>
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<td>Other expenses</td>
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<td><strong>Total Expenses</strong></td>
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<tr>
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<tr>
<td><strong>EXCESS OF REVENUES OVER EXPENSES</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td>2,607,746</td>
<td>2,277,973</td>
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Comprised of:

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<tr>
<th></th>
<th>2011</th>
<th>2010</th>
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<tr>
<td>Networks of Centres of Excellence (Schedule 1)</td>
<td>$2,304,143</td>
<td>$2,209,022</td>
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<tr>
<td>Non-Networks of Centres of Excellence (Schedule 2)</td>
<td>303,603</td>
<td>68,951</td>
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<tr>
<th></th>
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Innovation Nation:
Conference & Robotics Competition

Ontario
Province of Ontario Spotlight:
History of Innovation in Ontario

History Channel Documentary:
Canadian Made
strategy + teamwork
the CSii staff advantage

Lianne Stefurak
Executive Director

Debra Vivian
Director of Communications

Elizabeth Fabbroni Martin
Director of Operations

Kevin Randall
Senior IGAR Project Manager

Marie Fairgrieve
HR and Accounting, CSii, Manager, CMAS

Sherri Robertson Walker
Project Coordinator, Bariatric Registry

Ruth Breau
Research Coordinator

Jaclyn Kelly
Administrative Assistant

= the power to innovate