Medical Devices Challenges and Opportunities for Enhancing the Health and Wealth of Canadians

Prepared by

Medical Devices Innovation Institute (MDI²) in Consultation with National Stakeholders

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Medical Devices Challenges and Opportunities
for Enhancing the Health and Wealth of Canadians

Prepared by the Medical Devices Innovation Institute (MDI®) with the participation and in consultation with representatives of major medical devices related stakeholders including:


Universities: Carleton University, McGill University, University of British Columbia, University of Calgary, University of Manitoba, University of Ottawa, University of Victoria, University of Waterloo, University of Western Ontario.

Hospitals/Research Institutes: Canadian Surgical Technologies and Advanced Robotics (CSTAR), Children’s Hospital of Eastern Ontario, CHEO Research Institute, Elisabeth Bruyere Research Institute, Gestion Sovar Inc., London Health Sciences Centre, Montfort Hospital, Montreal Jewish General Hospital/Montreal Neurological Institute, Ottawa Hospital Research Institute, Queensway Carleton Hospital, St. Boniface General Hospital Research Centre/Institute of Cardiovascular Sciences, The Ottawa Hospital, University of Ottawa Eye Institute, University of Ottawa Heart Institute, University of Ottawa Institute of Mental Health Research, World Discoveries.


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EXECUTIVE SUMMARY

1. INTRODUCTION: This report entitled “Medical Devices Challenges and Opportunities for Enhancing the Health and Wealth of Canadians” builds on the results of extensive experience and hundreds of consultations with leading national and international stakeholders (industry, hospitals, universities, governments, and other related agencies) from across the medical devices sector over the last two decades.

This work culminated in the 2010 Medical Devices Summit hosted by the Medical Devices Innovation Institute (MDI²) and held on May 13, 2010 in Ottawa, Canada. This grassroots based national summit brought together senior officials (Presidents, CEOs, Directors, etc.) of major stakeholders and other medical devices experts. The participants were engaged to identify the challenges and map a path forward for Canada to improve in the development and commercialization of needed and viable medical devices for the global market. Through plenary session speakers, breakout groups and relevant topics, recommendations were formulated towards turning the challenges and difficulties facing Canada into opportunities for future social and economic prosperity.

2. WHAT ARE MEDICAL DEVICES? A medical device is any instrument, apparatus, appliance, equipment, material, or other articles used in the healthcare delivery process (Figure 1). Healthcare delivery and advancement would not be possible without medical devices.

Figure 1 – Medical Devices Usage in Healthcare Delivery and Knowledge Creation
3. WHY FOCUS ON MEDICAL DEVICES? Establishing a knowledge based economy is seen as the way of the future for Canada and other advanced nations. The medical devices sector represents just such a knowledge based economy and provides a niche well suited to Canada’s core competencies and global reputation. This sector offers a wide range of social and economic benefits, including:

a) **Improved Healthcare**: Improve healthcare in Canada and around the world

b) **Reduced Costs**: Opportunities to reduce health care costs through innovations for prevention, early detection, diagnosis, treatment, rehabilitation and knowledge creation

c) **Productivity and Competitiveness**: Innovative medical devices also offer potential costs savings in other areas such as productivity and competitiveness by improving patient’s quality of life and ability to return to the workforce.

d) **Job Creation**: Generate new employment improving current technologies and/or producing new medical devices technologies

e) **Enhanced Prosperity**: Generate economic activities and investment in Canada

f) **Increased Exports**: Increase exports to global markets and enhance global competitiveness

g) **Reduce Sector Trade Deficit**: Reduce Canada’s reliance on imported medical devices

h) **Builds on Strengths**: Integrates Canadian strengths, capabilities and know-how in areas such as communications, high-tech industry, nanotechnology, healthcare delivery, biotechnology, genomics, medical research, finance, among others

4. **ECONOMIC IMPACT OF MEDICAL DEVICES**: The medical devices sector offers significant economic opportunities in terms of sustained market growth, economic diversification, employment expansion, and global export markets (Figures 2-5).
Figure 2 – Sustained Growth in the Medical Devices Sector (US)

Source: US Industrial Outlook Department of Commerce

Figure 3 – Canadian Exports by Sector (2009 and 2020 Potential)

Source of data: Export Development Canada (EDC) report 2010, and Industry Canada. Potential exports based on 15% of world market share in 2020 at 8% world market growth.
Figure 4 – Projected Employment Growth (2006-2016)

![Graph showing projected employment growth from 2006 to 2016 for different fields. The bar for Biomedical/Medical Devices shows the highest growth at 21%.]

“The aging of the population and the focus on health issues will drive demand for better medical devices and equipment…”


Figure 5 – Medical Devices Global Market and Potential Exports from Canada

![Graph depicting the projected world market and potential Canadian export from 2010 to 2020. The projected world market shows a growth rate of 8 to 20%. The potential Canadian export is shown as 15% of the world market.]

Source of data: MX: Business Strategies for Medical Technology Executives, 2008

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5. CHALLENGES FOR CANADA IN MEDICAL DEVICES: While there are vast opportunities for Canada in the medical devices sector, there are also challenges that negatively impact Canada’s performance in this sector and urgently need to be addressed, including:

a) Lack of sufficient medical devices expertise and skills
b) Lack of sufficient targeting of needed medical devices innovations
c) Lack of sufficient investment (public and private) especially at early stages, when the innovation is being developed and subject to high levels of risk
d) Lack of sufficient incentives to attract and retain industry
e) Lack of harmonization (internal and external) with other jurisdictions
f) Lack of a national priority and/or strategy for the sector

Each of these areas was examined in detail both through the ongoing consultations and the 2010 Medical Devices Summit which had expert interactive discussion groups focused on each of these topics areas. Specific approaches and potential initiatives to address each of these challenges have been identified and would be implemented through the proposed action plan and as a key component in a National Medical Devices Strategy.

6. HOW TO MOVE FORWARD? The next steps and proposed action plan consist of two undertakings:

a) Development of a National Medical Devices Partnership (Alliance): A multi-agency, grassroots, volunteer based group with a clear mandate for advancing innovations from concept to clinical use in Canada and for export to the global market.

b) Establishment of a Large Scale Medical Devices Capital Fund: This fund is estimated to be approximately $2B over 10 years and would include both public and private investments. The fund would invest in needed, viable, medical devices development and commercialization, primarily funded through investors with support of specific government incentives for investment. Additionally, the fund would support a national medical devices network (training, research,
support programs) and related infrastructure across the country with this component primarily funded through federal/provincial government investments and/or reallocations.

7. DELIVERABLES: It is believed that the following major deliverables (outcomes) can be achieved during the first 10 years:

a) **Create Jobs**: Diversify Economy and Create Quality Employment
   
   *(15,000 New Medical Devices Related Jobs)*

b) **Increase Exports**: Enhance Exports into the Global Market
   
   *(Double Medical Devices Exports into the Global Market)*

c) **Reduce Trade Deficit**: Reduce Reliance on Imported Medical Devices
   
   *(Eliminate or Substantially Reduce the Medical Devices Trade Deficit)*

d) **Enhance Access For Patients**: Enable Increased Access Needed Medical Devices
   
   *(Improved Access/Reduced Waiting Times for Canadians)*

e) **Innovative New Devices**: Bring Innovative Medical Devices to Market
   
   *(10 Innovative Medical Devices Commercialized for Global Market)*

8. CONCLUSIONS: Through enhancing collaboration and focus on this sector, Canada can become a leading player in the global medical devices market. In doing so, Canada and Canadians will be rewarded through meaningful social and economic benefits including economic growth, exports to the global market, reduced sector trade deficit, enhanced job creation and most importantly improved healthcare to save lives and reduce pain and suffering in Canada and around the globe.

*Tofy Mussivand, FRSC*

*Chair, 2010 Medical Devices Summit: Challenges and Opportunities for Canada*
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SECTION 1: MEDICAL DEVICES

This section outlines a summary of background information on medical devices.

1. WHAT ARE MEDICAL DEVICES? There are a number of specific definitions for medical devices in various jurisdictions. In general, these definitions can be summarized\(^1\) as any instrument, apparatus, appliance, equipment, material or other article, used in:

a) Prevention

b) Diagnosis

c) Treatment

d) Rehabilitation

e) Knowledge Creation (understanding, R&D, etc.)

The major differentiation from the pharmaceutical sector is that medical devices do not achieve their principal intended action by pharmacological means, but may be assisted in their function by such means for example a drug eluting stent is considered a medical device.

Medical devices are widely utilized in a variety of applications in healthcare delivery (Figure 1, page 3) as well as the creation of new knowledge which is essential for human development. Therefore, delivery and advancement of healthcare would not be possible without medical devices.

2. CANADA’S OPPORTUNITIES IN THE MEDICAL DEVICES SECTOR: The medical devices sector can offer significant opportunities for the future of Canada through a wide range of social and economic benefits, including:

a) Strong Market Growth: The worldwide medical devices market was estimated at approximately $330 billion/year in 2008\(^2\). This market is currently growing at 8-20% annually, and thus is rapidly approaching a trillion dollars per year. The medical devices sector is also now outperforming the pharmaceutical sector in terms of overall growth rate.

\(^1\) Definition used by the Medical Devices Innovation Institute based on existing FDA, European Union and Health Canada definitions.

\(^2\) MX: Business Strategies for Medical Technology Executives, 2008
US medical devices shipments provide an illustrative example of the sustained growth potential in this sector (Figure 2, page 4). Of specific note, this sector is largely recession proof which is especially attractive in these turbulent economics times. Key growth drivers of the sector include increased wealth and demand for better healthcare around the globe, and in emerging market economies including the so-called BRIC nations (i.e. Brazil, Russia, India and China). For example, the medical devices market in China is forecast to grow approximately 24% over the next several years and will largely be served by imports ³.

b) Economic Diversification: Canada could capture a meaningful share of the medical devices export markets around the globe. The Medical Devices Innovation Institute has estimated an enhanced medical devices sector in Canada could rapidly outstrip other key exports and become one of Canada’s strongest export sectors in the coming decades (Figure 3, page 5). This would lead to important economic diversification and other related benefits.

c) Job Creation: The medical devices sector also provides employment opportunities that are projected to increase substantially over the next decade. While there are no specific employment statistics for this sector, biomedical engineering employment projections provide valuable insight into future job growth. Detailed figures from the US Department of Labor forecast employment for this area to grow at a rate of 21% through 2016 (Figure 4, page 5), outperforming all other engineering disciplines. Various sector analyses have also identified major skill shortages in Canada encompassing wide ranging positions including regulatory affairs, clinical trial expertise and senior management among others. The medical devices and technology sector will thus clearly be an important source of high quality employment in future decades.

d) Canadian Strengths: Canada also has a number of important unique attributes that can be leveraged for an enhanced medical devices sector; 1) market proximity to the US, the leading consumer of medical technology, 2) a public healthcare system with strong clinical research capabilities, 3) a highly educated workforce, and 4) internationally respected and stable financial system. Of special note, Canada’s current position in terms of debt and deficits in relation to GDP (Gross Domestic Product) is strong in comparison to other jurisdictions. While Canada has a current budget deficit it is of a much lesser scope than in other jurisdictions, making investment in Canada particularly advantageous and provides government the opportunity for large scale targeted investment (Figure 6 & 7, page 14).

³ Xinhua Financial Network Report, 2007
Figure 6 – Annual Government Surplus/Deficit as Percentage of GDP

Source: International Monetary Fund, World Economic Outlook Database, October 2010

Figure 7 – Total Government Net Debt as Percentage of GDP

Source: International Monetary Fund, World Economic Outlook Database, October 2010
It is hoped that with effective initiatives such as in medical devices exports that the trade imbalance in this sector can be significantly reduced or eliminated. Even more importantly, Canada leads the G7 with the lowest cost of doing business (after-tax cost of startup and operations over 10 years) in the medical devices industry\(^4\).

**e) Future Outlook:** Canada’s national healthcare system is increasingly dependent on medical devices and, as such, a strong medical devices sector is essential to provide Canadians with high quality healthcare in the coming decades. There are also excellent opportunities for Canada in this sector based on the following factors:

1. Medical devices are a leading global economic market
2. Medical devices can provide a clean industry and knowledge based economy
3. Medical devices can provide sustainable employment and economic growth
4. Medical devices are well suited to Canada’s skills and capabilities
5. Medical devices can build on Canada’s social healthcare system investments
6. Medical devices can generate exports into a rapidly expanding global market

**3. CANADA’S CHALLENGES IN THE MEDICAL DEVICES MARKET:** While there are vast opportunities for Canada in the medical devices sector, there are also important challenges Canada must address:

**a) Growing Medical Devices Sector Trade Deficit:** Canada is one of the most advanced countries in the world with many important medical discoveries. However, Canada is lagging other developed countries in commercializing innovations into marketable products. Canada imports approximately 80-85% of medical devices for domestic use, and has an increasing trade deficit in this sector of over $2B/year (Figure 8, page 16).

\(^4\) KPMG, Competitive Alternatives, 2010.
b) Poor Performance in Export Rankings: Canada also ranks poorly in comparison to other Organisation for Economic Co-operation and Development (OECD) countries in share of instrumentation exports (including medical devices) as illustrated in Figure 9.

![Figure 8 - Canada's Medical Device Trade Deficit](image)

**Figure 8 – Canada’s Medical Device Trade Deficit**

![Figure 9 - Performance in the Instrumentation Exports](image)

**Figure 9 – Performance in the Instrumentation Exports**

c) Delayed Patient Access to Medical Devices: The ability to maintain a high quality healthcare system is increasingly dependent on medical devices and technology. In spite of high healthcare spending relative to other OECD countries, access to medical devices and technology in Canada ranks below average (Figure 10, page 17). If Canada is
to maintain and improve the healthcare system for its citizens, it must ensure access to new and innovative technologies. A strengthened medical devices sector would thus contribute toward this vital imperative and also contribute to improving Canadian’s health and reduce the associated social and economic impacts related to health status.

Figure 10 – Access to Medical Devices and Technology

![Bar Chart]


d) Reasons for Poor Sector Performance: Canada’s relatively poor performance in this sector is complex and multi-factorial; however six major areas that negatively impact Canadian performance in this sector have been identified including:

1. Lack of sufficient medical devices know-how, expertise and skills
2. Lack of sufficient targeting of needed medical devices innovations
3. Lack of sufficient investment (public and private)
4. Lack of sufficient incentives to attract and retain industry
5. Lack of harmonization (both domestically and with other jurisdictions) in areas such as regulation, reimbursement, etc.
6. Lack of a national priority and/or strategy for the sector
SECTION 2: CRITICAL ISSUES FACING CANADA IN MEDICAL DEVICES
This section provides an overview of critical issues facing Canada in the medical devices sector, identified through ongoing consultations with relevant organizations (industry, universities, hospitals, government and others) across Canada. These critical issues served as a foundation for the discussion groups at the 2010 Medical Devices Summit.

The following six critical areas requiring attention to retain, expand and enhance the medical devices sector in Canada have been identified:

1. BUILDING MEDICAL DEVICES EXPERTISE/SKILLS: A successful medical devices sector requires a wide range of specialized core expertise (e.g. in medicine, engineering and business) as well as highly trained personnel from other disciplines including legal, regulatory, reimbursement, intellectual property, marketing, financial, etc. with specific expertise in the medical devices sector. With a relatively underdeveloped medical devices industry, Canada suffers an acute shortage of this type of expertise with well documented skills shortages.
Skills shortages are widely considered one of the major barriers impacting Canada’s position in this sector. BioTalent Canada in their September 2008 report entitled “Segmenting the Data - Regional labour market information on biotechnology in Canada” noted that the “Shortage of skilled/experienced workers” was the number one rated challenge facing medical devices companies across all regions of Canada\(^5\). It was further noted that in Ontario (location of 60% of medical devices companies in Canada), over 34.3% of companies have unfilled positions and 54.8% report a shortage of skilled workers. Furthermore, MEDEC, Canada’s industry association for medical devices companies has previously identified considerable skills shortages noting “a shortage of highly educated and skilled workers will limit the growth of Canada’s medical devices industry”\(^6\). The Ottawa Centre for Research and Innovation (OCRI) has also identified skills shortages, noting “Shortages of technical staff with clinical trial experience, and a serious shortage of senior executives with the required, yet unique, technical and regulatory management experience”\(^7\).

Despite the acknowledgement of this critical barrier, there have been limited activities in Canada to further enhance the advanced training required to address these skills shortages. While some individual small scale training programs have been implemented in recent years, these programs suffer from a lack of sustained funding, often have a limited focus (e.g. focus solely on one aspect such as biomedical engineering) and/or do not have the scale and capacity to truly address both current and future needs of the sector. A comprehensive series of high quality and wide-ranging training programs are clearly required to meet Canada’s current and future needs.

2. **TARGETING INNOVATIONS/DISCOVERIES:** Funding for medical devices related research and development in Canada is extremely limited. There is also a major disconnect between clinical needs and research activities. Establishing mechanisms to identify specific clinical needs and targeted funding to address these high potential opportunities for innovation can be an effective approach. This approach has been utilized successfully in other sectors within Canada with success in the automotive, telecommunications and aerospace industries. While there are a number of specific mechanisms to implement targeted funding in this sector, a coordinated national

\(^5\) Segmenting the Data - Regional labour market information on biotechnology in Canada. Biotent Canada. 2008 www.biotent.ca.
\(^6\) MEDEC. MEDEC’s Appraisal of Canada’s Innovation Strategy.
approach is required given the need to harness Canada’s diverse pockets of expertise which are spread across the country.

3. ENHANCING HARMONIZATION/COORDINATION: Currently Canada has substantial inter-provincial and international barriers in the medical devices sector. These barriers could be reduced through increased harmonization and coordination. While the internal barriers are largely due to the separation of healthcare roles and responsibilities within various levels of government in Canada, opportunities exist nonetheless to reduce these barriers.

From an industrial perspective, companies face both national regulatory approvals and multiple provincial barriers in terms of reimbursement and technology adoption. In recent years this has become an increasingly contentious issue for Canadians with certain treatments (including utilization of medical devices) being offered in some provinces but not in other provinces. In many ways this situation does not meet the intent of the Canada Health Act of providing universal, accessible and portable healthcare to all citizens. In addition, this situation frustrates and overwhelms industry to the point where some companies are abandoning or ignoring Canada as a market.

On the global stage while Canada has been actively engaged in global harmonization initiatives such as the Global Harmonization Task Force (GHTF) for medical devices which includes the European Union, United States, Canada, Australia and Japan, it is clear that Canada’s regulatory system remains a major concern for industry. Delays in Canadian approvals for devices already approved in other advanced jurisdictions are widely considered the major concern for both domestic and international companies. Furthermore, given Canada’s relatively small domestic market, the additional regulatory burdens represent a serious barrier to utilizing new technologies in Canada. There are also those that have expressed concern over the progress of the GHTF to bring about meaningful changes, considering this initiative has now been underway for over 18 years. Additionally, many countries are not part of the GHTF. Clearly efforts to enhance the regulatory system within Canada and to examine new approaches to true harmonization among nations are required. While such undertakings can require extensive long term multi-lateral processes, opportunities exist for Canada to implement unilateral actions that could streamline approvals without escalating the risk for Canadian patients.
4. OPTIMIZING INCENTIVES: Attracting large multi-national medical devices companies, retaining existing companies and expanding the sector through new spin-offs will require a wide range of incentives in today’s highly competitive global context. The location of medical devices industry in specific jurisdictions, is determined by a large number of factors, however ongoing optimization and enhancement of incentives is required. While recent positive changes in the corporate tax structure within Canada have been implemented, other jurisdictions can and have offered vastly lower tax rates to target this sector. Given the national importance of the medical devices sector, further refinement of incentives through a variety of programs and approaches is clearly required. Such incentives and programs have been utilized successfully in other industries deemed critical to Canada.

A variety of incentive programs exist, but it is clear that many medical devices organizations are either unaware of the programs, and/or find the processes burdensome and/or not attractive enough. In addition, these programs are not well coordinated amongst the various governmental organizations to provide an efficient systemic approach across the sector. Furthermore, while larger companies have the capacity and knowledge to access existing programs, smaller medical devices companies (which represent the majority of companies in the sector) require specific guidance and assistance in accessing existing programs. For this reason, a comprehensive examination of existing programs and potential new incentives including direct investment, establishment of large scale facilities, development of quality support programs, implementation of advanced training programs, etc. needs to be undertaken in relation to the medical devices sector to ensure growth of the critical sector in Canada.

5. INCREASING INVESTMENT (PRIVATE/PUBLIC): It is widely acknowledged that investment, both public and private, needs to be enhanced in relation to the medical devices sector in Canada. Public research funding in this sector is extremely limited in part due to the structure of roles and responsibilities of the major funding councils. This problem is not unique to Canada; other jurisdictions have recognized this problem and implemented successful structural changes which Canada should also consider to address this critical issue. Implementing a dedicated funding body with specific expertise for the sector is critical to ensuring the sector obtains vitally important research funding.
In terms of private investment, the medical devices sector while offering substantial returns is also high risk and requires longer term horizons for return on investment compared to other sectors. For this reason, policies and incentives to encourage and increase private investment in this sector are required. There are a number of approaches available to government in this area including support for the establishment of medical devices targeted venture funds and tax incentives for investments in the sector. Given the strategic importance of the sector to Canada and Canadians, such programs could be highly successful and measurably enhance the availability of private investment.

6. ESTABLISHING A NATIONAL MEDICAL DEVICES STRATEGY: Given the importance and potential social and economic benefits of an enhanced medical devices sector, as well as the major challenges to be addressed, a national strategy is clearly essential. A national strategy also provides an important signal to global investors and businesses that the country is actively engaged in a long-term and sustained initiative in this sector. This also provides the basis for establishing nationwide collaborations amongst Canadian leaders in the sector that have the knowledge and vision to drive innovation across the entire sector. An integrated and effective national strategy can thus enhance Canada’s standing in this sector as has been demonstrated successfully in other international jurisdictions which have adopted strategies and industrial policy targeting the medical devices sector.
SECTION 3: MEDICAL DEVICES INITIATIVES (WHAT OTHERS DO)

This section provides information on specific medical devices related programs and initiatives utilized in other jurisdictions (i.e. countries that have achieved success in the global medical devices market for example US, Ireland, Switzerland, etc.)

1. INTERNATIONAL SCOPE: The medical devices sector is now truly global in nature and has evolved significantly over the last three decades. Previously, the sector was typically structured around branch plants in individual countries; however globalization and market growth in emerging economies have led to a more regionalized structure. Furthermore, various countries (jurisdictions) have identified medical devices as an important and valuable contributor to their national economies and have actively undertaken concerted strategies to attract the sector’s leading organizations and made large scale investments to develop strong domestic medical devices sectors. Unfortunately, Canada lags far behind in this respect and is largely a net consumer of medical devices rather than a producer and/or exporter. Canadian exports of medical devices have also remained relatively flat over the last decade resulting in a longstanding and measurable trade deficit for this sector. More alarming is the fact that one of Canada’s largest medical devices export sub-sectors is paper based medical products.

A number of nations have significant success in the medical devices sector including the United States, the United Kingdom, Ireland, Switzerland, Germany, South Korea and Singapore. These nations are not just major exporters of medical devices but are also leaders in medical devices innovation. Specifically, the United States has the largest medical devices market worldwide and is also the leading global supplier of medical devices with 16 of the top 25 medical devices companies based in the U.S. Ireland is a relatively small nation, but the Galway region has the highest concentration of medical devices companies in Europe. Switzerland, another relatively small country, is home to some 500 medical technology companies with exports reaching $5B US/year. The United Kingdom has undertaken a major reinvention of their entire medical devices supply chain an area that is also worthy of examination in the Canadian context. Singapore is also emerging as a major destination for global medical devices companies as a regional centre for both manufacturing and R&D.

Each of these nations has specific attributes and/or strategies that contribute to their overall success in the medical devices field. The proceeding sections highlight some of
these initiatives and programs that may be of specific interest towards the goal of enhancing Canada’s medical devices sector.

2. EXPERTISE TRAINING: To become a major producer of innovative medical devices, acquiring highly trained professionals is essential. The medical devices research and development field requires multidisciplinary expertise combining medicine, engineering, other sciences, business, and the humanities. The U.S. has a number of programs which provide good examples of educational programs designed to develop expertise in medical devices.

Stanford University’s Biodesign Innovation Program focuses on the medical devices innovation process and has been highly successful in generating new medical devices and companies. The program’s collaborative approach leads multidisciplinary teams through the medical technology development stages beginning with a clinical need assessment by engaging participants at the Stanford Medical Center in order to address the needs facing healthcare providers and patients. Thereafter, the teams work to develop their concept through literature and patent searches as well as the input from a panel of experts. Lastly, the program stresses design and prototyping to provide a solution to the identified need followed by the development of appropriate business models.

Northwestern University’s NUvention Medical Innovation course pairs a variety of students (medicine, law, engineering, and business graduates) with clinical faculty to observe all aspects of patient care and obtain hands on experience with medical devices. The lecture and project based course focuses on needs assessment, intellectual property, prototyping, and clinical trials. Importantly, students learn about governmental regulations, reimbursement opportunities, finance and markets, and developing a business strategy.

Purdue University takes a different approach to foster innovation by providing a unique opportunity for undergraduate students to gain entrepreneurship experience. Similar to an academic Minor degree, the Burton D. Morgan Center for Entrepreneurship offers a certificate for the successful completion of five courses available as early as freshman year and open to all faculties. Two compulsory courses focus on opportunity assessment, finance, market research, management, and team building. Thereafter, students have the opportunity to do an internship with a start-up company to foster the interaction with practicing entrepreneurs. This program grew in popularity to over...
1,000 students enrolled after just 3 years, highlighting an increasing interest in entrepreneurship among undergraduates.

While the US is a leader in medical devices related educational programs, several other countries successful in the medical devices sector are also worthy of note. For example, Switzerland is a nation with a rich medical history and a strong technological base that fosters the highly qualified workforce required in the medical devices field. Switzerland has two institutes of technology that specialize in medical devices engineering as well as seven universities of applied sciences. In 2004, the Swiss Center for Science and Technology Studies ranked first for engineering and second for life sciences on a worldwide scale.

Similarly, the UK focuses on continually improving its training programs and supporting its successful institutions. Primarily, the UK increased funding for successful multidisciplinary doctoral training centers, such as Oxford’s Imaging and Nanobiotecnology Institute. In Ireland, which is an emerging medical devices manufacturing powerhouse, the National Centre for Biomedical Engineering Science provides an interdisciplinary collaborative teaching approach. The centre also offers training courses as well as industry internships through the Irish Medical Device Association.

3. INSPIRING INNOVATION: A competitive setting serves to inspire and generate interest among students and innovators alike. Design challenges, competitions, and visionary projects act as a means to push forward ideas, which may lead to the formation of more spin-off companies. The U.K. serves as an example where the Biotechnology Young Entrepreneurs Scheme provides students with an opportunity to develop their own start-up bioscience business plan under the support of researchers, investors, and industry mentors. The program has spurred new found student interest in commercialization of innovation.

The Medical Device Network Invention Challenge, a U.S. based competition at Stanford, is central to the aforementioned Biodesign program. The competition is held twice a year where the Schools of Medicine and Engineering faculty pose a medical devices challenge based on real clinical problems. Multidisciplinary teams of students pose a solution that is assessed by a multidisciplinary faculty team and a patent attorney judge. The university’s Office of Technology Licensing files the ideas deemed fit for patenting. In addition, the National Collegiate Inventors and Innovators Alliance run the national BME-IDEA competition that promotes innovative medical devices commercialization.
The participating teams of students are evaluated on their commercialization strategy based on developing a device to solve a clinical problem and meet technical, economic, and regulatory requirements. The winning group must have a design that is novel and practical as well as possess commercialization potential. Incentives include a $10,000 cash prize for first place as well as the provision of training and resources for follow-on product development and commercialization.

Another excellent example of inspiring innovation is the 2008 Future of Sutures Competition developed by Braun (a major German medical devices company) that leveraged international scientific and technical skills to develop pioneering solutions for surgical wound closure. This high profile competition gained major international recognition and succeeded to bring about 180 competitors from 27 countries. The winner of the competition received €100,000 and a total of €400,000 were distributed in prizes to national and international winners.

The Operating Room of the Future (ORF) is a visionary project undertaken by the Centre for Integration of Medicine and Innovative Technology (a consortium of Boston’s leading hospitals and engineering schools). This project brought together multiple universities, hospitals, and industry partners in order to address real clinical problems. The aim of ORF is to provide a laboratory that explores new medical technology for performing minimally invasive surgery. This transformative visionary project utilizes a multidisciplinary research approach to optimize facility design and technology requirements. Specifically, the ORF intends to lead a national initiative on technology integration and creating an open Plug-and-Play standard for medical devices in the operating room.

4. PROMOTING DIALOGUE: Nations with successful medical devices sectors employ networking and dialogue between academics, industry, and government to their advantage. For example, the Cleveland Clinic hosts an annual Medical Innovation Summit for 900 senior executives, investors, entrepreneurs, and clinicians in order to promote discussions with world leaders that are responsible for the current and future trends in health care technology. In addition, the summit offers an analysis of new directions for supporting innovation and providing an annual list of top 10 medical innovations in order to stimulate thinking on future trends. Similarly, Ireland’s Annual Biomedical Conference brings together PhD students in the field in a social event setting that is designed to create connections and inspire collaborations. Furthermore, Ireland has closely integrated and coordinated activities between government, academia, and
industry that have widely been acknowledged to be a major factor in attracting major medical devices manufacturers to Ireland in addition to the favorable tax structure for such organizations.

The United Kingdom developed a Healthcare Industries Task Force (HITF), an initiative undertaken by government and the healthcare industry, in order to explore issues of interest and opportunities for co-operation for the benefit of the healthcare system, patients, and industry. The HITF reports touch upon a wide range of topics concerning medical devices including regulatory requirements, fostering innovation, funding education, and improving research, development, and integration. Of specific interest to Canada is UK’s National Health Service (NHS) supply chain re-engineering undertaking as well as the NHS Innovation Centre and regional hubs established to “champion the cause of healthcare innovation and to identify, develop and commercialize innovations and Intellectual property” from within their national healthcare system.

5. TARGETED SPENDING: Adequate and focused funding practices have been an integral part of the success of many nations. In 2000, the US Congress recognized that research funding for medical devices was not adequately served through the existing structure of the National Institutes of Health (NIH), and established the National Institute of Biomedical Imaging and Bioengineering in order to provide targeted funding directly to medical devices and technology research and development. It should be noted that Canada faces a similar problem in that medical devices research and development is not adequately served through the funding councils. In addition, the Small Business Innovation Research program in the US actively supports early stage medical devices companies through relatively large grants and contracts providing critical funds to advance new medical devices to market.

Other nations have achieved success through alternative routes. South Korea launched the Highly Advanced Nation (HAN) project with the aim of turning Korea into one of the top seven technologically advanced nations. Korea concentrates and directs its limited R&D resources into key technology areas, one of which is medical technology. Particularly, the investment of $160M in medical technology was niche focused on the imaging sub-sector based on where existing expertise could utilize this funding to push forward. Likewise, Ireland prioritizes funding in this area with some €646M dedicated to the creation of Science Foundation Ireland as well as the establishment of the National Centre for Biomedical Engineering Science in order to increase medical devices technology research and education.
Singapore is perhaps the best example of targeted spending. In 2000, the government undertook a major initiative to turn Singapore into “Asia’s premier hub for biomedical sciences, with world-class capabilities across the entire value chain, from basic research to clinical trials, product/process development, full-scale manufacturing and healthcare delivery”\(^8\). To achieve this vision a number of key initiatives were undertaken including; 1) US$1 billion fund to boost public investment in the sector, 2) Establishment of a new Biomedical Research Council, 3) Building a new life science complex (Biopolis), 4) Establishment of three bioscience venture capital funds to support start-ups, among other initiatives. As a result, Singapore has become a major regional force in the sector with numerous global medical devices organizations, establishing regional headquarters, global manufacturing facilities and Asian R&D centres.

6. **MARKET ADVANTAGES:** Several external or internal conditions can also influence a nation’s medical devices sector. For example, the United Kingdom’s public health system is now viewed within government as a strategic competitive advantage that can be harnessed for enhancing the medical devices sector in the UK. In addition, market proximity provides Ireland with direct access to the 2nd largest medical devices market, the European Union. Equally, Switzerland has a central location for the European markets. Furthermore, Switzerland’s strong financial system and stock market with biotech indices are particularly advantageous. Lastly, Korea is now viewed as the Asian research and development hub for major imaging companies given the substantial investment made towards in that particular niche.

An important initiative that attracts medical devices corporations is favorable tax policies. The success of this initiative is evident in Switzerland where substantial tax incentives and subsidies to major industry made Switzerland home to 500 medical devices companies and many world-class pharmaceutical companies. Similarly, Ireland’s tax environment offering a 12.5% corporate tax rate, research and development tax credits and patent royalty tax exemptions, all contributed to their rapid advancement in this sector. Due to the Irish Government’s grant assistance, research and development is now an integral part of 57% of their medical devices companies. Korea also established a reimbursement system that was structured to promote investment in technology. Importantly, tax policies for foreign companies in selected industries such as the medical devices are being widely utilized to attract leading medical devices


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manufacturers to a number of countries based on the substantive benefits the industry provides in terms of economic development, employment and clean industry. In addition, locations such as Puerto Rico and Mexico offer increasingly attractive tax structures for global medical devices companies to locate in their jurisdiction.

Table 1 highlights some of the major drivers for success in these various jurisdictions which have contributed to success in the global medical devices sector and that may be of specific interest to advancing Canada’s standing in this sector.
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Key Drivers of Success</th>
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| 1. United States (USA)       | #1 Medical Devices Supplier – 16 of the top medical devices companies US based  
• Market Size: Largest World Market for Medical Devices  
• Targeted Funding: NIH focus on medical devices including small business support program SBIR  
• Targeted Funding: Established and funded NIH BioEngineering Institute  
• Expertise: Clusters of medical devices expertise (Minnesota, Massachusetts, Bay Area). |
| 2. United Kingdom (UK)       | Complete reengineering as result of Government Health Industries Task Force (HITF) Reports  
• Public Health System: Consider NHS a benefit for Medical Devices sector development  
• Supply Chain: Rebuilding supply chain for hospitals with Industry including small business  
• Innovation Training: Developed a National Innovation Centre and regional Hubs  
• Integrated Approach: Close linkages between key stakeholders (academic, hospital, industry) |
| 3. Ireland                   | Focussed tax policy to attract major medical devices manufacturers  
15 of the top 25 medical devices companies have manufacturing units in Ireland.  
• Tax Environment: Extremely favourable tax regime (12.5% Corporate Tax Rate)  
• Market Proximity: Direct Access to 2nd largest Medical Devices Market (European Union)  
• Priority Funding: Focus of both the Science Foundation Ireland & Enterprise Ireland  
• Training: Established National Centre for Biomedical Engineering Sciences (NCBES) |
| 4. Switzerland               | Small Country - 500 Medical Technology companies with $5B (US)/year in exports  
• Highly Educated Workforce: Highly qualified and sophisticated multilingual workforce  
• Market Proximity: Central location for European Markets  
• Financial System: Strong Financial System and Stock Market (SWX) with biotech indices  
• Incentives: Willing to provide substantial tax incentives and subsidies to major industry |
| 5. South Korea               | G7 HAN (Highly Advanced Nation) Program with Medical Technology as a key focus area  
• Niche Focus: Focussed primarily on one sub-sector (imaging) based on existing expertise  
• Tax Environment: Tax benefits for foreign companies in selected industries including healthcare  
• Targeted Funding: Significant government investment targeted for sector  
• Market proximity: Well-located as an Asian R&D Hub for major imaging companies |
| 6. Singapore                 | Major Government Strategy to Establish Singapore as the Leading Asian Biosciences Centre National Priority: Established large national strategy & public investment (over $1B investment)  
• Targeted Funding: Established dedicated Biomedical Research Funding Council  
• Commercialization Focus: Established Venture Capital Funds to support spin-offs  
• Training: Established large scale research institutes in specific niches  
• High Visibility Project: Establishment of large scale advanced facilities (Biopolis) |
A review of these key drivers demonstrates a number of common attributes among successful jurisdictions:

a) Industrial Policy/National Strategy
b) Dedicated National Institutions/Networks
c) Tax and other Critical Incentives
d) Market Access and Integration with Health Systems
e) Commitment to Advanced Sector Training
f) Sustained Long-Term Focus

7. CANADIAN CONTEXT: It is noteworthy that relatively small nations such as Ireland, Singapore and Switzerland have been able to establish strong medical devices sectors; these are nations that Canada can and should compete with in the global market. While Canada’s performance lags in certain aspects such as innovation, productivity, targeted training in this area and stand alone tax incentives, it has a number of important attributes that can be leveraged for an enhanced medical devices sector; a) market proximity to the US, the leading consumer of medical technology, b) a public healthcare system with strong clinical research capabilities, c) a highly educated workforce, and d) internationally respected financial system. With these potential market advantages, Canada has a strong foundation on which to enhance the medical devices sector, however these advantages need to be leveraged through enhanced collaboration, integration and establishing medical devices as national priority as other advanced nations have done.
SECTION 4: SUMMIT PLENARY SESSION

This section provides an overview of the Plenary Session the 2010 Medical Devices Summit and key topics identified by the keynote speakers.

1. WELCOMING CEREMONY:

Dr. Tofy Mussivand, Director and CEO, Medical Devices Innovation Institute and the Chair of the 2010 Medical Devices Summit opened the summit by having Dr. Wilbert J. Keon, founder of the University of Ottawa Heart Institute and long serving Canadian Senator introduce the opening speaker Mr. Allan Rock, President and Vice-Chancellor, University of Ottawa and formerly Federal Minister of the departments of Justice, Industry and Health as well as Canada’s Ambassador to the United Nations (UN).

Mr. Alan Rock welcomed the summit delegates by indicating that Canada has significant capabilities applicable to the medical devices market, but what is required is to bring all the pieces together in a cohesive manner to support innovation in this sector through good public policy and developing enhanced collaboration among the major stakeholders each contributing along the way to ensure that our research discoveries move through the pipeline to reach commercialization and most importantly clinical use. In order to reach this goal, what is clearly required and the focus of the summit is a national strategy for Canada’s medical devices sector.

Mr. Claude Haw, President and CEO, OCRI outlined the goal of OCRI as the lead economic development agency for the city of Ottawa to advance the local economy. In large part this entails bringing together stakeholders to nurture innovation. Mr. Haw noted that the medical devices sector in Ottawa is rapidly emerging and world class globally competitive medical devices companies such as Zarlink Semiconductor, Best Medical, DNA Genotek, Abbot Point of Care are based in Ottawa. In addition, wide ranging expertise is also located in Ottawa within government departments,
national organizations and local universities, hospitals and research centres. He further noted that the summit was designed to bring together leaders from across Canada to work together with the goal of advancing the sector nationally and to focus on the ultimate goal of delivering improved healthcare technologies to everyone in the world.
2. PLENARY SESSION – SPEAKERS

Challenges and Opportunities in the Medical Devices Sector/Summit
Goals & Objectives

Dr. Tofy Mussivand, Director & CEO, Medical Devices Innovation Institute, University of Ottawa

Presentation Summary: Dr. Mussivand, Chair of the 2010 Medical Devices Summit highlighted the challenges and opportunities facing Canada in the medical devices sector based on his extensive experience in Canada and around the globe. Dr. Mussivand noted the following:

1) Note there are several key questions to be answered as part of the 2010 Medical Devices Summit:
   a. Why is Canada not a leader in the medical devices market?
   b. What barriers cause Canada to lag in this market?
   c. What are the strengths that Canada can leverage?
   d. How do we enhance Canada’s standing in this market?
   e. How do we formulate a National Strategy for Medical Devices?

2) Highlighted Canada’s standing in the medical devices sector most notably, that Canada’s medical devices exports have remained relatively flat over the last decade while export growth in the US has shown sustained growth due to increasing global demand (Figure 11, page 35).

3) The significant global demand represents a major opportunity for Canada as medical devices is one of the fastest growing economic sectors worldwide (Figure 12, page 36).

4) Highlighted the future potential for the medical devices sector to become a leading sector for exports in comparison to other Canadian exports such as energy, automotive, food, etc. (Figure 13, page 36).

5) Highlighted several attributes which make Canada particularly well positioned for advancing the medical sector including strong clinical research capabilities, highly educated workforce, expertise in advanced technology, proximity to the largest consumer of medical devices the US, among others.
6) Highlighted several barriers that Canada must overcome in this sector which were identified and served as the major topics of the discussion groups of the 2010 Medical Devices Summit, namely:

a) Lack of medical devices skills
b) Lack of targeted R&D and resulting needed discoveries
c) Lack of investment (public and private)
d) Lack of incentives to attract/retain industry/experts
e) Lack of coordination and harmonization
f) Lack of a National Medical Devices Strategy

Figure 11 – Medical Device Export Market Growth (Canada and US)

Source of data: US Trade and Commerce and Industry Canada

May 13, 2010  T. Mussivand – Medical Devices Innovation Institute
Figure 12 – Potential Medical Device Export Market for Canada

**Medical Devices Global Market and Exports From Canada**

- **Projected World Market (8 to 20% growth rate)**
- **Potential Canadian Export (15% of World Market)**
- **Canadian Export (Current)**

Source of data: MX: Business Strategies for Medical Technology Executives, 2008

May 13, 2010  T. Mussivand – Medical Devices Innovation Institute

Figure 13 – Potential Medical Device Export Market for Canada

**Medical Devices Could Become a Leading Sector in Canada**

- **Exports in 2009**

Potential exports based on 15% of world market share in 2020 at 8% world market growth.

Source of data: Export Development Canada (EDC) report 2010, and Industry Canada

May 13, 2010  T. Mussivand – Medical Devices Innovation Institute

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Medical Devices: In Need of Championing and Partnerships for Care and the Economy

Dr. Jacques Bradwejn, Dean, Faculty of Medicine, University of Ottawa

Presentation Summary: Dr. Bradwejn provided perspective of what he termed the loss of opportunity for Canada in medical devices and the need for championing to highlight the substantial benefits for patients, the healthcare system and the economy. Dr. Bradwejn noted the following:

1) Medical devices are an increasingly important aspect of healthcare delivery and essential in all aspects of the process e.g. prevention, diagnosis, treatment and rehabilitation.

2) Noted the large trade deficit Canada has in the medical devices area and the potential opportunity to advance Canada’s standing based on the relatively poor performance in export market share compared to other OECD countries (Figure 14, page 38).

3) Indicated that there are opportunities to gain ground and that Canada should be able to compete with countries such Switzerland and Ireland who are leaders in this area.

4) Suggested that leadership and championing has an important role to play in advancing Canada’s standing in this sector and reaping the associated economic and social benefits.

5) Champions are needed across the sector for example, in hospitals, in industry, in government and in universities to highlight the potential benefits for Canada.

6) Noted the University of Ottawa has already begun championing this cause through the establishment of the Medical Devices Innovation Institute which has strong support across the university and an interdisciplinary focus involving the faculties of medicine, engineering, science and others.

7) Noted the Institute is really championing a collaborative (not competitive) approach involving stakeholders from other universities, hospitals, industry and government working together to enhance this sector in Canada.

8) The summit is intended to begin the process of championing and that the participants can be and are champions of this cause in their own areas.
9) Expected that through greater collaboration across the country, the opportunities to enhance Canada’s standing in the medical devices sector can be fully realized.

10) Benefits for patients, hospitals, the healthcare system and economy that can be achieved by working collaboratively to improve Canada’s ranking could be substantial.

**Figure 14 – Export Market Share Rankings**

Canada could Emulate Switzerland in Medical Devices

The ratio of a country’s share of OECD instruments exports to its share of total OECD exports.

A value of less than 1 means that the country does not have a comparative advantage in that industry.

**Export Market Share: Instruments, 2006**

(share of OECD instruments exports relative to share of total OECD exports)


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Canada’s Current Place in the Medical Devices Industry

Mr. Neil Fraser, President, Medtronic Canada

Presentation Summary: Mr. Fraser provided an important global perspective on Canada’s standing in medical devices having served as President of Medtronic Canada since 2004 as well as a member of Medtronic’s International Leadership Team. Mr. Fraser noted the following:

1) Canada does have a strong reputation and capability for research but has not been as aggressive as others such as the US in commercialization of the research.

2) In Canada, 80% of university research is funded by government whereas in the US 80% of university research is funded by industry.

3) Highlighted the major global medical jurisdictions, noting most of the major activity is in the US, Puerto Rico, along the Mexican border, Ireland, Switzerland, Israel, Singapore and now expanding into China.

4) Noted the major barriers for Canada included the small market, high level of regulation, and the fact that new technologies typically get approved in Europe, Asia and the US before being approved in Canada.

5) A difficult procurement environment in Canada, with complex market access and a tax environment that does not match the rest of the world in this sector (Figure 15, page 40).

6) Highlighted the emergence of Singapore as a major destination for the medical devices sector noting this is in large part to having a national strategy and industrial policy targeted at the sector.

7) Noted the major advantages of Singapore include access to talent and ideas, strong and reliable supplier base, connectivity and market access, a strong demand for medical technologies and a competitive tax environment.

8) Recommended that Canada focus on:
   a. Enhancing innovation as Canada significantly lags other nations,
   b. Enhancing industrial policy for this sector,
   c. Improving the overall tax environment,
   d. Addressing internal barriers to market access.
9) He further recommended focusing on the emerging markets of India and China.

10) Suggested building on Canada’s world-class expertise in health technology assessment and building clusters of expertise around our universities and hospital research centres.

**Figure 15 – Comparative Tax Rates for Medical Device Manufacturing**
How to Build a Sustainable Device/Diagnostic Platform in Canada

Mr. Oak Noell, Divisional Vice President, Abbott Point of Care

Presentation Summary: Mr. Noel provided a unique perspective being from the US, but having spent several years in Canada and being responsible for operating the Ottawa medical devices manufacturing facility which is home to approximately 850 employees. Mr. Noell noted the following:

1) While the Ottawa facility is a relatively large employer for Ottawa, it is very small part of Abbott which has some 83,000 employees in 60 countries and sales of $30B in 2009.

2) The reason this facility is in Canada is because the initial technology was developed here and Ottawa had specific high technology expertise that was required at that time. He further noted that the reason the plant remains here is in large part because the plant is highly automated and that moving it to another country has limited advantages as automation costs are consistent across jurisdictions.

3) Provincial funding for employee training programs have been extremely helpful in ensuring access to high quality employees which is essential in the medical devices sector.

4) Suggested that Canada would have difficulty in attracting large manufacturers given the competition from other countries such as Ireland with the already established manufacturing base and emerging countries such as China with favourable labour rate advantages not to mention vast tax advantages being offered by many other jurisdictions.

5) The recent and rapid rise in the Canadian dollar only makes the prospect of attracting manufacturers to Canada much more difficult.

6) Canada may be better off to focus on pioneering new medical devices and technology and developing the sector and environment to retain these companies within the country.

7) Since Canada is not a large consumer nation, a clear focus on the US and other markets is essential.
8) Recommended areas that Canada could potentially focus on including, devices and technologies that specifically aim to reduce healthcare costs and serve the aging population (Figure 16).

9) Also highlighted the need for expertise and development of enhanced compliance technologies across the sector.

10) Note that both these areas (healthcare costs and compliance) are growing in importance and represents important challenges not only for Canada but for all jurisdictions and as such represent meaningful future opportunities in the medical devices sector.

Figure 16 – Areas of Potential Opportunity for Canada
SECTION 5: SUMMIT RECOMMENDATIONS
This section provides a summary of the recommendations derived from the discussion groups at the 2010 Medical Devices Summit.

The 2010 Medical Devices Summit held in Ottawa on May 13, 2010 was an invitation only event which brought together senior officials (Presidents, CEOs, Directors, etc.) of major stakeholders and other medical devices experts from industry, universities, hospitals, government and related organizations from across Canada. The objective of the summit was to establish a dialogue towards advancing a National Strategy for medical devices and technology for Canada. The summit included six multi-disciplinary, multi-agency discussion groups focused on specific topic areas previously identified by the Medical Devices Innovation Institute as crucial issues related to advancing the medical devices sector in Canada:

1. Building Medical Devices Expertise/Skills
2. Targeting Innovations/Discoveries
3. Enhancing Harmonization/Coordination
4. Optimizing Incentives
5. Increasing Investment (Private/Public)
6. Establishing a National Medical Devices Strategy

Further details and the resulting recommendations of each of these discussion groups are outlined in the proceeding pages. The specific recommendations provided were prepared by the Co-Chairs of the respective discussion groups.
DISCUSSION GROUP 1 - BUILDING MEDICAL DEVICES EXPERTISE/SKILLS

Participants

Dr. Mona Nemer, Vice-President, Research, University of Ottawa (Group Co-Chair)
Ms. Colette Rivet, Executive Director, BioTalent Canada (Group Co-Chair)

Mr. Eric Bosco, VP, Business Development - Quebec & Atlantic Canada, MITACS
Dr. Christian Detellier, Associate Vice-President, Research, University of Ottawa
Mr. Kim Greenwood, Director, Biomedical Engineering, Children's Hospital of Eastern Ontario
Dr. Pejman Hanifi-Moghaddam, Research Associate, National Research Council of Canada
Mr. Moazzam Khan, President, Vitesse Re-Skilling Canada
Ms. Philippa King, Business Development Manager, Ontario Centres of Excellence
Dr. Frank Knoefel, Clinical Scientist, Elisabeth Bruyere Research Institute
Dr. Ezra Kwok, Director, Biomedical Engineering, University of British Columbia
Dr. Michel Labrosse, Director, Ottawa-Carleton Institute for Biomedical Engineering
Ms. Linda Lindsay, Director, Regulatory Affairs & Quality systems, St. Jude Medical Canada Inc.
Dr. Homer Yang, Chief of Anesthesiology, the Ottawa Hospital

Mr. Antony Robert, Medical Devices Innovation Institute (Graduate Student Observer/Assistant)

Scope

The challenge set forth for the discussion group in this area was to develop recommendations on “How to develop the multi-disciplinary expertise required to address critical skill shortages in the Medical Devices sector in Canada”. The multidisciplinary participants in this discussion group included senior representatives from universities, industry, hospitals/research institutes, and related organizations with specific expertise related to this area. To facilitate the discussions regarding “Building Medical Devices Expertise/Skills” a series of questions based on preliminary consultations were provided to the groups participants.

1. What specific skills are lacking, i.e. Regulatory, Business Expertise, etc.?
2. What can be done better to expose students to the significant career opportunities?
3. How best to implement hands-on experience rather than just theoretical?
4. Should sector training be to specific groups e.g. engineers or across disciplines, and which ones?
5. How can skills in high tech be better engaged in medical devices?

**Group Recommendations**

1. Develop Interdisciplinary educational programs (i.e. engineering, life sciences, business, Intellectual Property, regulatory)
2. Develop mechanism for continued professional development
3. Promote industry engagement in academic training
4. Create a business led NCE-like program to act as a Centre of Excellence for medical devices for education, research and development
5. Develop a mechanism to motivate professors to participate in industry-based research
6. Develop fellowship/professional programs for local or internationally educated professionals to work in medical devices
7. Increase collaboration between all granting agencies to support training and research in medical devices
8. Enhance public awareness of science and engineering
9. Enhance training science teachers in schools
DISCUSSION GROUP 2 - TARGETING INNOVATIONS/DISCOVERIES

Participants

Mr. Harry Page, CEO, UBM TechInsights (Group Co-Chair)
Mr. Tom Schonberg, President & CEO, Queensway Carleton Hospital (Group Co-Chair)

Ms. Laura Brown, Student, University of Ottawa
Mr. John Gams, Principle, SAGA International Consulting
Mr. Gary Hannah, CEO, Vocantas
Dr. Mark Hoddenbagh, Director, Applied Research and Innovation, Algonquin College
Mr. Joe Irvine, Director, Technology Transfer and Business Enterprise, University of Ottawa
Dr. Étienne Lagacé, Principal, iNovia Capital
Dr. Bernard Leduc, President & CEO, Montfort Hospital
Mr. Kirk Mandy, President and CEO, Zarlink Semiconductor
Dr. Zul Merali, President/CEO/Scientific Director, University of Ottawa Institute of Mental Health Research
Mr. Scott Moffitt, Medical Technology Development Officer, BioNova
Dr. Reza Moridi, MPP, Richmond Hill
Ms. Lori O'Neill, Partner, Deloitte & Touche
Dr. Martin Osmond, CEO & Scientific Director, CHEO Research Institute
Ms. Karen Robb, Manager, Life Sciences, Ottawa Centre for Research and Innovation (OCRI)
Mr. Bruce Robertson, President and CEO, Angus Medical Inc.
Dr. Mark Schweitzer, Chief & Chair, Diagnostic Imaging, The Ottawa Hospital
Dr. Duncan Stewart, CEO and Scientific Director, Ottawa Hospital Research Institute
Dr. Stan Swirhun, Chief Technology Officer, Zarlink Semiconductor
Ms. Nadine Tatton, Commercialization Manager - Life Sciences Transfer of Technology & Business Enterprise, University of Ottawa

Dr. Armin Sabri, Medical Devices Innovation Institute (Post Doctoral Fellow)

Scope

The challenge set forth for the discussion group in this area was to develop recommendations on “How to unlock capabilities from Hospitals, Universities and Industry to more effectively address clinical needs”. The multidisciplinary participants in this discussion group included senior representatives from universities, industry, hospitals/research institutes, and related organizations with specific expertise related to
this area. To facilitate the discussions regarding “Targeting Innovations/Discoveries” a series of questions based on preliminary consultations were provided to the groups participants.

1. Can hospitals play a bigger role in identifying device needs and how?
2. How can the public health system be leveraged for enhanced success of Canadian medical device companies, i.e. procurement incentives, enhanced access, etc.?
3. Can R&D be better focused on patients’ needs?
4. Can targeted medical device needs be better addressed through calls for proposals similar to the NIH model for specific technology development programs?
5. How can University technology research groups be more be more effectively engaged in addressing hospital needs?

Group Recommendations

1. Create and Capitalize on clusters
   a. Including industry, hospitals, academics and government
   b. Result: opportunities are not left to chance
2. Increase industry to industry collaboration (SME - Small to Medium Enterprise)
   a. Sharing ideas even infrastructures
   b. Result: new innovative products
3. Promote opportunities for industry to shadow clinicians
   a. Similar to existing academic programs for medical students
   b. Result: Opportunities for re-developing and enhancement of products
4. Grants and Incentives
   a. Use broad pool to help identify real innovative ideas
5. Capitalize on lower-cost medical devices commercialization
   a. Compared to pharmaceutical activities
   b. Result: Lower cost and shorter incubation period between product development and market entry
6. Think big or go home!
   a. But be realistic about timelines
   b. Competitive and sustainable results are expected
7. Capitalize on existing manufacturing
   a. Capabilities in other sectors
8. Basic Clinical & applied research
   a. Identify opportunities that are suitable for commercialization and actual potentials for putting in practice
9. Focus! Pick your places! Early wins
10. Provide better commercialization support
11. More effective regulatory environment
12. Simplify and Improve the procurement process
DISCUSSION GROUP 3 - ENHANCING HARMONIZATION/COORDINATION

Participants

Mr. Brandon Armstrong, 3M Canada Company (Group Co-Chair)
Mr. John Parker, Director, Canadian Surgical Technologies and Advanced Robotics (Group Co-Chair)

Mr. Frank Baylis, President, Baylis Medical Canada
Dr. Tammy Clifford, Chief Scientist, CADTH
Mr. Peter Covitz, Senior Vice President, MDS Nordion
Dr. Balbir Dhillon, Professor, Department of Mechanical Engineering, University of Ottawa
Mr. Grant Jameson, Senior Partner, Ogilvy Renault
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Ms. Nancy Ruth, Director, Medical Devices, i3CanReg Inc.
Mr. Lawrence Sereacki, Vice President, Corporate Affairs, MEDEC
Ms. Nancy Shadeed, Acting Manager, Device Licensing Division, Health Canada
Ms. Anne Tomalin, President, i3CanReg Inc.

Mr. John Szalas, Medical Devices Innovation Institute (Graduate Student Observer/Assistant)

Scope

The challenge set forth for the discussion group in this area was to develop recommendations on “How to advance harmonization efforts within Canada (e.g. reimbursement, technology assessment, etc.) and internationally (regulatory)”. The multidisciplinary participants in this discussion group included senior representatives from universities, industry, hospitals/research institutes, and related organizations with specific expertise related to this area. To facilitate the discussions regarding “Enhancing Harmonization/Coordination” a series of questions based on preliminary consultations were provided to the groups participants:

1. Can technology assessment be streamlined nationally, to reduce disparities in access, improve quality, and reduce duplication?
2. Can conflicting rules/standards within Canada be eliminated?
3. Should Canada work towards harmonization by adopting an approach where devices approved in other advanced countries are approved without additional burdens?

4. How can delayed access/reimbursement for newly approved technologies be reduced?

Group Recommendations

1. If it is Canada’s goal to be a global player in medical devices:
   a. It must become a “producer” nation and drive harmonization.
   b. Requires more than “just” Health Canada (i.e. Industry Canada, DFAIT-Foreign Affairs and International Trade) i.e. focused policy that addresses safety and economic development.
   c. Regulatory environment that supports the global growth of Small and Medium Enterprise (SME) while protecting patient safety (under resourced/funded).

2. Difficulties surrounding reimbursement and "health economics" for SMEs need to be addressed, because:
   a. Each province and territory has its own framework and requirements can be quite different even at the regional or hospital level.
   b. This situation is compounded with differences found in the global market place.
   c. This represents a very serious barrier to entrance for any SME that is looking to grow in Canada and beyond.
DISCUSSION GROUP 4 – OPTIMIZING INCENTIVES

Participants

Dr. Richard Bonato, Founder & CEO, Braebon Medical Corporation (Group Co-Chair)
Dr. Morris Milner, President & CEO, The Health Technology Exchange (Group Co-Chair)

Dr. Pierre Bilodeau, Director, Bio Industries, Research Partnerships Programs, NSERC
Mr. Al Bryenton, President & CEO, Biopeak
Ms. Shelagh McDonald, Executive Director, Eastern Lake Ontario Regional Innovation Network
Mr. Bryan McLellan, Chief Financial Officer, Johnson and Johnson Medical Products
Dr. George Michaliszyn, Director, Life Sciences Industries Branch, Industry Canada
Ms. Rana Rahal, Student, University of Ottawa
Mr. Joseph Rios, Sector Advisor, Life Sciences & Light Manufacturing, EDC
Mr. Dan Sinai, Director, Research Development & Services, The University of Western Ontario
Mr. Jamie Stiff, Partner, Genesys Capital
Mr. Don Wilford, Ontario Centres of Excellence
Mr. John Zinderdine, Special Assistant, Council Office, City of Toronto

Mr. Bashir Morshed, Medical Devices Innovation Institute (Post Doctoral Fellow)

Scope

The challenge set forth for the discussion group in this area was to develop recommendations on “How to develop sufficient and attractive incentives and initiatives focused on attracting and retaining medical devices industry, investors, innovators, experts, etc.”. The multidisciplinary participants in this discussion group included senior representatives from universities, industry, hospitals/research institutes, and related organizations with specific expertise related to this area. To facilitate the discussions regarding “Optimizing Incentives” a series of questions based on preliminary consultations were provided to the groups participants:

1. Canada claims to be attractive for medical devices, is it? If so, why such poor performance in the sector?
2. What type of programs can be developed to attract various different groups i.e. researchers, investors, manufacturing?
3. What incentives/initiatives in other jurisdictions have proven successful? (Is South Korea G7 HAN – Highly advanced Nation Program a good model)
4. Can specific investment incentives targeted for the medical devices sector be implemented, for example flow-through shares?

**Group Recommendations**

1. Enhance SR&ED (Scientific Research and Experimental Development) Tax Incentive Program – e.g. underwriting, such as EDC (Export Development Canada) programs (publicity); monthly reimbursements; indexing (Currently $3 M – since 1982 $2 M); incentives to reinvest
2. Replicate OCE (Ontario Centres of Excellence) and HTX (Health Technology Exchange) programs across Canada; enhance through possible CECR (Centres of Excellence for Commercialization and Research) federal support
3. Provide direct support to SMEs regarding validation, regulation, reimbursement along the lines of embedded executives with relevant expertise
4. Focus on compliance issues and build expertise between post-secondary institutions and industries (Nortel, Algonquin College etc.)
5. Promote strategic partnerships among SMEs and MNEs (Multi-National Enterprises)
6. Engage large companies to explore new technologies possibilities presented by SMEs
7. Eliminate systemic procurement barriers for medical technologies
8. Incentive for programs: e.g. TPC (Technology Partnerships Canada) and PEMD (Program for Export Market Development)
DISCUSSION GROUP 5 - INCREASING INVESTMENT (PRIVATE/PUBLIC)

Participants

Dr. Pierre Chartrand, Chief Scientific Officer and Vice-President, CIHR (Group Co-Chair)
Dr. Peter Morand, Chair, Gestion Sovar Inc. (Group Co-Chair)

Dr. Cedric Bisson, Managing Partner, Life Sciences, iNovia Capital Inc.
Ms. Mary Boreskie, Policy Advisory, Life Sciences Industries Branch, Industry Canada
Dr. Jacques Bradwejn, Dean, Faculty of Medicine, University of Ottawa
Mr. Earl Bryenton, President and CEO, Brytech Inc.
Mr. Stephen Fanjoy, President, Therapeutic Monitoring Systems Inc.
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Mr. Claude Haw, President & CEO, Ottawa Centre for Research and Innovation
Mr. Rob Hilkes, President, eSight Corp.
Ms. Eileen Jessop, Portfolio Manager, Research Partnerships, Natural Sciences and Engineering Research Council of Canada
Mr. Mark Kershey, President, Spartan Bioscience
Ms. Sheema Khan, Registered Patent Agent, Miltons IP
Mr. Richard Meadows, Managing Partner, CTI Life Sciences Fund
Mr. Marshall Ring, Executive Director, Biomedical Commercialization Canada
Mr. Kim Ryel, Business Advisor Medical Devices, Nanotechnology, Dept. of Foreign Affairs & Intl’ Trade
Mr. Dave Smardon, Managing Partner and Co-Chairman, Nibiru Capital Management
Mr. Timothy Smith, Octane Medical Group

Mr. Iyad Kandalaft, Medical Devices Innovation Institute (Graduate Student Observer/Assistant)

Scope

The challenge set forth for the discussion group in this area was to develop recommendations on “How to increase strategically targeted and sustainable public and private investment and funding for medical devices research, development and commercialization”. The multidisciplinary participants in this discussion group included senior representatives from universities, industry, hospitals/research institutes, and related organizations with specific expertise related to this area. To facilitate the
discussions regarding “Attracting Investment (Private/Public)” a series of questions based on preliminary consultations were provided to the groups participants:

1. Who funds Medical Devices? NSERC & CIHR, both or neither, Is a separate group needed as NIH did through the Beacon Program to address funding disparities.
2. Can a specific medical devices appropriation for R&D from governments be established?
3. Can a program like the US SBIR (Small Business Innovation Research) program be implemented to support early stage medical devices companies?
4. How can non-governmental investment in medical devices be enhanced?

Group Recommendations

1. Fix valley of death between university output & first in humans results
   a. Organize networks of experts
   b. Flow through shares or Angel tax credit
   c. Increase amount for translational applications (IRAP, CIHR)
2. Create national lobby / pan-Canadian organization to prepare ground for robust strategy
3. Create incentives for limited partnerships (government / universities pension funds) to commit capital to Canada-based venture capital (VC) investors in Medical Devices
4. Leverage large medical devices companies by creating incentives if they invest in Canadian companies
   a. Not penalty, but positive incentives (faster review for reimbursement)
   b. Needs to be pan-Canadian
5. Human Resources (HR)
   a. Find a few executives who are “Canada friendly” to come back to Canada and help Canadian initiatives
   b. Re-enforce university programs to train people in medical devices development & commercialization
6. Review Canadian intellectual property(IP) policies so that Canada meets best practices on IP
7. Ontario Venture Enterprise Fund and other similar funds allocate a certain percent (15%?) to Medical Devices companies to emphasize the importance of the Medical Devices sector in Canada
8. Put forward a program to attract private investment in Medical Devices companies
9. VCs from the US will invest in Canada if there are organizations have shown due diligence in monitoring small start-up projects. We need to attract VCs from the US.
DISCUSSION GROUP 6 - ESTABLISHING A NATIONAL MEDICAL DEVICES STRATEGY

Participants

Mr. Neil Fraser, President & Corporate Vice President, Medtronic Canada Ltd. (Group Co-Chair)
Mr. Michael Thompson, Toronto City Councilor (Group Co-Chair)

Mr. Sebastien Bureau, Audit Professional, Office of the auditor General of Canada
Mr. Victor Diciccio, Research Professor, Institute for Computer Research, University of Waterloo
Mr. Ragnar Dworschak, Director, Technical Services, Best Theratronics Inc.
Mr. Fred Fiksel, President, HTC Associates, Healthcare Technology Consultants
Dr. Rose Goldstein, Vice-President of Research, University of Calgary
Ms. Cheryl Holden, Global Practice Lead, Dept. of Foreign Affairs & Intl' Trade
Mr. Kevin Holmes, Senior Staff Member, Medical Devices Innovation Institute
Dr. Lorenzo Leonardi, Medical Device Sector Coordinator, NRC Institute for Biodiagnostics
Ms. Lucia Martinez, Program Officer, Research Partnerships Programs, Natural Sciences and Engineering Research Council of Canada
Mr. Paul Paolatto, Director, World Discoveries
Dr. Gabriela Prada, Director of Health innovation, Policy and Evaluation, The Conference Board of Canada
Dr. Maitham Shams, Professor, Carlton University
Dr. Ian Smith, Director General, NRC Institute for Biodiagnostics
Mr. Jac Van Beek, Independent Strategist

Mr. Kevin Hamdullahpur, Medical Devices Innovation Institute (Undergraduate Student Observer/Assistant)

Scope

The challenge set forth for the discussion group in this area was to develop recommendations on “How to develop a coordinated effective and sustainable focus on medical devices through a national strategy”. The multidisciplinary participants in this discussion group included senior representatives from universities, industry, hospitals/research institutes, and related organizations with specific expertise related to this area. To facilitate the discussions regarding “Toward a National Medical Devices Strategy” a series of questions based on preliminary consultations were provided to the groups participants:
1. Is a campaign to obtain endorsement from groups like Canadian Medical Association, etc. appropriate?
2. What form should the Strategy ultimately take – organization, legislation, white papers, conference, working groups, etc.?
3. How to develop a long-term sustainable initiative 10 years +, not subject to elections and changing priorities?
4. How best to engage the public, politicians, and key players, is a signature project needed for visibility – for example – “Made in Canada Operating Room”?
5. Who will pay or help pay for these activities?

**Group Recommendations**

1. Identify Core Technological Strengths in Canada
2. Survey Market Opportunities (examples Remote Monitoring, Mental Health)
3. Short Term: Incubators that encompasses the R&D, government, Universities, and private sector (example HTX Model)
4. Short Term: Leverage medical devices as a priority area of STIC - Science, Technology and Innovation Council
5. Long Term: Virtual Center of Excellence/Institute that addresses advocacy, National policy, marketing communication
6. Share our success stories as part of communication
SECTION 6: ACTION PLAN

This section provides an overall summary of the findings related to Canada’s medical devices sector and the action plan proposed to enhance and expand this critical sector to benefit Canada and Canadians.

1. CONSENSUS: Wide ranging consultations since 1998, including most recently the 2010 Medical Devices Summit with major medical devices sector stakeholders from across the country has demonstrated strong support for a nationally coordinated and collaborative initiative with a goal of enhancing Canada’s medical devices sector. Widespread consensus exists on critical areas requiring attention, as well as various approaches and solutions that could enhance this vital sector in Canada to benefit the health and wealth of Canadians, namely:

   a) Global Market Opportunities: The medical devices sector offers potential for significant social and economic benefits for Canada and Canadians in the coming decades through an expanding global market and demand for medical devices and technologies.

   b) Canada has Market Strengths: Canada has several market strengths and advantages that can be leveraged to enhance Canada’s standing in the global medical devices sector.

   c) Challenges and Barriers Need to be Addressed: There are critical issues that require urgent attention in order to make Canada globally competitive in this sector including:

      • Need for a National Medical Devices Strategy (high priority)
      • Need for the Establishment of a Centre of Excellence Type Program for Medical Devices
      • Need for Targeted Funding Programs for Medical Devices R&D and Commercialization
      • Need for Policies/Programs to Provide Attractive and Persuasive Incentives and Financing
2. ACTION PLAN: There is unfortunately no concerted collaborative national focus and/or voice for medical devices in Canada, and an utmost need for this in terms of a sustained long-term focus for advancing this crucially important sector. As noted by several speakers, there is a need to look to future opportunities and the focus should be on training of expertise, inspiring innovation, promoting dialogue and collaboration, focusing on and improving funding, utilizing market advantages, and formulating favorable policies and incentives not only for today but also for tomorrow. Ultimate success lies in formulating a unique and innovative strategy based on the knowledge acquired from current leaders in the medical devices field and optimizing this strategy for the current Canadian context. To be effective in advancing the medical devices sector, a single group or short-term program is not sufficient, instead a long-term sustained integrated approach with multiple programs and collaborative partners from across Canada is clearly required. In addition, a meaningful level of investment from both public and private sources would be required. As such, the proposed action plan consists of 2 major undertakings:

a) Development of a National Medical Devices Partnership (Alliance): Establish a stakeholder driven volunteer organization with a clear mandate to collaboratively develop and promote policies and initiatives aimed at enhancing Canada’s medical devices sector. The alliance would undertake the leadership role in the development and promotion of a National Medical Devices Strategy. The proposed alliance would consist of volunteer representatives from the major stakeholders from industry, government, hospitals, and universities. These representatives would engage stakeholders across the country to obtain participation, support and contributions towards advancing the mandate. The intent of the alliance is not to duplicate the work of various existing groups and organizations but is intended to bring together expertise from across the sector to collaborate and join forces to bring about needed and meaningful change.

b) Establishment of a Large Scale Medical Devices Capital Fund: Given the scope of work to be undertaken, significant time and investment would be required. Based on the level of investment and duration of successful initiatives in other sectors as well as similar initiatives in other jurisdictions, it is estimated that a 10 year program and investment of approximately $2B over this time period would be required. This fund would include both public and private investments. The fund would invest in needed, viable, medical devices development and commercialization, primarily funded through investors with support of specific government incentives for investment. Additionally, the fund would support a national medical devices network (training, research, support programs) and related infrastructure across the country with this component primarily funded through federal/provincial government investments and/or reallocations.
3. BENEFITS AND OUTCOMES: Through implementation of the proposed action plan it is believed that the following major deliverables (outcomes) can be achieved during the first 10 years:

   a) **Create Jobs**: Diversify Economy and Create Quality Employment  
      *(15,000 New Medical Devices Related Jobs)*
   
   b) **Increase Exports**: Enhance Exports into the Global Market  
      *(Double Medical Devices Exports into the Global Market)*
   
   c) **Reduce Trade Deficit**: Reduce Reliance on Imported Medical Devices  
      *(Eliminate or Substantially Reduce the Medical Devices Trade Deficit)*
   
   d) **Enhance Access For Patients**: Enable Increased Access Needed Medical Devices  
      *(Improved Access/Reduced Waiting Times for Canadians)*
   
   e) **Innovative New Devices**: Bring Innovative Medical Devices to Market  
      *(10 Innovative Medical Devices Commercialized for Global Market)*
   
   f) **Reduce Skill Shortages**: Training of Medical Device Specialists  
      *(New Experts to Fill Existing Skills Shortages)*

It is sincerely hoped that major stakeholders from across the country will endorse this proposal and this action plan to establish a collaborative, viable and sustainable initiative focused on enhancing Canada’s medical devices sector now and in the future. It is time to build on the developed momentum and widespread consensus and follow through with a comprehensive National Medical Devices Strategy supported by the major stakeholders that is capable of re-inventing Canada’s medical devices sector. In this way Canada can become a major player in the tomorrow’s global medical devices market and all while enhancing the health and wealth of Canadians.
APPENDIX: ACKNOWLEDGEMENTS

The Medical Devices Innovation Institute (MDI²) would like to acknowledge the valuable contributions of the wide cross-section of stakeholders from industry, hospitals, investors, academia and related government organizations whom have contributed to this report. These partners, supporters, advisors and all the organizations and their representatives from across the country that participated in various consultations and related activities have been extremely generous with their time and support for collaborative efforts to enhance this vitally important sector for Canada. Their input in identifying the critical issues facing the medical devices sector in Canada and recommendations for important activities moving forward is greatly appreciated. Their ongoing contributions and participation has already and will undoubtedly continue in the future to enhance the medical devices sector in Canada and the health and wealth of Canadians.

A. PARTICIPATING ORGANIZATIONS

**Medical Devices Industry**

1. 3M Canada Company
2. Abbott Point of Care
3. Angus Medical Inc.
4. Best Theratronics Inc.
5. Biopak
6. Braebon Medical Corporation
7. Brytech Inc.
8. DNA Genotech
9. Edwards Lifesciences Canada
10. Johnson & Johnson Medical Products
11. MDS Nordion
12. Medtronic Canada Ltd.
13. Octane Medical Group
14. Spartan Bioscience
15. St. Jude Medical Canada Inc.
16. UBM TechInsights
17. Zarlink Semiconductor

**Universities**

18. Carleton University
19. McGill University
20. University of British Columbia
21. University of Calgary
22. University of Manitoba
23. University of Ottawa
24. University of Victoria
25. University of Waterloo
26. University of Western Ontario

**Hospitals/Research Institutes**

27. Canadian Surgical Technologies and Advanced Robotics (CSTAR)
28. Children’s Hospital of Eastern Ontario
29. CHEO Research Institute
30. Élisabeth Bruyère Research Institute
32. London Health Sciences Centre
33. Medical Devices Innovation Institute
34. Montfort Hospital
35. Montreal Jewish General Hospital/Montreal Neurological Institute
36. Ottawa Hospital Research Institute
37. Queensway Carleton Hospital
38. St. Boniface General Hospital Research Centre/Institute of Cardiovascular Sciences
39. The Ottawa Hospital
40. University of Ottawa Eye Institute
41. University of Ottawa Heart Institute
42. University of Ottawa Institute of Mental Health Research
43. World Discoveries

**Related Financial/Legal**

44. Borden Ladner Gervais LLP
45. CTI Life Sciences Fund
46. Deloitte & Touche
47. Genesys Capital
48. Gowlings
49. iNovia Capital Inc.
50. Miltons IP
51. Nibiru Capital Management, Ltd.
52. Ogilvy Renault

**Related Government Organizations**

53. Canadian Institutes of Health Research (CIHR)
54. City of Toronto
55. Department of Foreign Affairs & International Trade
56. Economic Development Canada
57. Government of Ontario
58. Health Canada
59. Industry Canada, Life Sciences Branch
60. Ontario Ministry of Research & Innovation (MRI)
61. National Research Council of Canada (NRC)
62. Natural Sciences and Engineering Research Council of Canada (NSERC)
63. NRC Institute for Biodiagnostics
64. Office of the Auditor General of Canada (OAG)
65. Ontario Centres of Excellence (OCE)
66. The Senate of Canada

**Other Related Organizations**

67. Biomedical Commercialization Canada
68. BioNova
69. BioTalent Canada
70. Canadian Agency for Drugs and Technologies in Health
71. Eastern Lake Ontario Regional Innovation Network (ELORIN)
72. HTC Associates, Healthcare Technology Consultants
73. i3CanReg Inc.
74. Medical Devices Canada (MEDEC)
75. Mathematics of Information Technology and Complex Systems Network (MITACS)
76. Ottawa Centre for Research and Innovation (OCRI)
77. SAGA International Consulting
78. The Conference Board of Canada
79. The Health Technology Exchange
80. Vitesse Re-Skilling Canada
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<td>Dr. Bram Ramjiawan</td>
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<td>Mr. Marshall Ring</td>
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<td>Mr. Joseph Rios</td>
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<td>Ms. Colette Rivet</td>
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<td>Ms. Karen Robb</td>
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<td>Dr. James Robblee</td>
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<td>Mr. Antony Robert</td>
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<td>Mr. Bruce Robertson</td>
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<td>Ms. Janet Ronsky</td>
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<td>Dr. Roland Rotter</td>
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<td>Dr. Roseann O’Reilly Runte</td>
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<td>Ms. Nancy Ruth</td>
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<td>Mr. Kim Ryel</td>
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<td>Dr. Armin Sabri</td>
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<td>Dr. Tomas Salerno</td>
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<td>Dr. Abdelhamid Sayari</td>
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<td>156.</td>
<td>Dr. Gary Slater</td>
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C. SUMMIT PROGRAM COMMITTEE

1. Mr. Claude Haw, President & CEO, Ottawa Centre for Research and Innovation (OCRI)
2. Dr. Ray Barton, CEO, Vitesse Re-Skilling Canada
3. Dr. Richard Bonato, President & CEO, Braebon Medical Corporation
4. Mr. Paul Bradley, Vice President, Strategic Affairs, Johnson & Johnson Medical Products
5. Mr. Stephen Dibert, President, Medical Devices Canada (MEDEC)
6. Mr. Joe Irvine, Director, Technology Transfer & Business Enterprise, University of Ottawa
7. Dr. Morris Milner, President & CEO, The Health Technology Exchange, Canada
8. Mr. Paul Paolatto, Director, World Discoveries
9. Mr. Dan Sinai, Director, Research Development & Services, University of Western Ontario
10. Dr. Ian Smith, Director General, NRC Institute for Biodiagnostics
11. Mr. Michael Thompson, Councilor, Scarborough Centre, City of Toronto
12. Dr. Tofy Mussivand (Summit Chair), Director & CEO, Medical Devices Innovation Institute, University of Ottawa
D. SUMMIT DISCUSSION GROUP CO-CHAIRS

1. **Discussion Group 1 - Building Medical Devices Expertise/Skills**
   Dr. Mona Nemer, Vice-President, Research, University of Ottawa
   Ms. Colette Rivet, Executive Director, BioTalent Canada

2. **Discussion Group 2 - Targeting Innovations/Discoveries**
   Mr. Harry Page, CEO, UBM TechInsights
   Mr. Tom Schonberg, President & CEO, Queensway Carleton Hospital

3. **Discussion Group 3 - Enhancing Harmonization/Coordination**
   Mr. Brandon Armstrong, 3M Canada Company
   Mr. John Parker, Director, Canadian Surgical Technologies and Advanced Robotics (CSTAR)

4. **Discussion Group 4 - Optimizing Incentives**
   Dr. Richard Bonato, Founder & CEO, Braebon Medical Corporation
   Dr. Morris Milner, President & CEO, The Health Technology Exchange

5. **Discussion Group 5 - Increasing Investment (Private/Public)**
   Dr. Pierre Chartrand, Chief Scientific Officer & Vice-President, Canadian Institutes of Health Research
   Dr. Peter Morand, Board Chair, Gestion Sovar Inc.

6. **Discussion Group 6 - Establishing a National Medical Devices Strategy**
   Mr. Neil Fraser, President & Corporate Vice President, Medtronic Canada Ltd.
   Mr. Michael Thompson, Toronto City Councilor
E. OTHER SUMMIT SUPPORTERS

1. **Financial Sponsors:** Thank you to Abbot Point of Care, HTX – The Health Technology Exchange and UBM TechInsights for financial support.

2. **Books for Delegates:** Thank you to Miltons IP for supplying the delegates with the book entitled “*Canadian Intellectual Property Law for Dummies*” and Dr. George Michaliszyn at Industry Canada for providing the delegates the guidebook entitled “*Canadian Medical Technologies: Product & Industry Guide 2009*”.

3. **Summit Logistics:** Thank you to Mr. Claude Haw at the Ottawa Centre for Research & Innovation (OCRI) for his organization’s support and to the OCRI staff who played vital roles in organizing the summit; Nicole Lamoureux, Kathy Mahoney, Karen Robb, Patricia Ward-Tippett, Anna Zielinski, Kim Cunningham, Jeff Elyea, Walter Noble and Alex Pugh.

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