

# Three Missions One Future

Optimizing the Performance of Canada's  
Academic Health Sciences Centres



A Report From the National Task Force  
on the Future of  
Canada's Academic Health Sciences Centres

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We would also acknowledge the significant efforts of all members of the National Task Force. Their commitment, passion, perspectives and insights have been the driving force behind the writing of the report, its overall structure, content and tone, the recommendations and implementation strategies.

The Steering Committee, co-Chaired by Mr. Glenn Brimacombe (President & CEO, Association of Canadian Academic Healthcare Organizations), and Dr. Nick Busing (President & CEO, Association of Faculties of Medicine of Canada) have played a crucial role in supporting the process of the National Task Force.

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# Message From the Co-Chairs of the National Task Force

When Canadians talk about the future of our health system, a number of policy issues immediately come to mind – wait times and access to care, shortages of health care providers, patient safety and the quality of care, an aging population, the introduction of new technologies and innovations, the role of the public and private sectors from a financing and delivery perspective, and the cost of new drugs – to name a few.

As important as it is to identify stable and lasting solutions to these pressing policy challenges, rarely has there been a specific focus on the role that Canada’s Academic Health Sciences Centres (AHSCs) play in contributing innovative solutions to improve patient care and population health outcomes and the overall functioning of the health system.

Supporting the mission and mandate of AHSCs is critical to ensure access to a range of specialized health services, educating the next generation of health providers, and generating and disseminating new scientific knowledge and innovations that make the system more cost-effective, adaptive and flexible. In our view, AHSCs have a pivotal role to play in contributing to the longer-term sustainability of the health system.

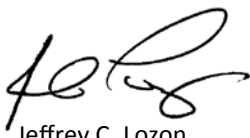
Knowing that the health system continues to experience a significant amount of change, we believe it is incumbent on the leadership of AHSCs across the country to take stock and reflect on their roles and responsibilities. More particularly, now is time for AHSCs and their provincial, territorial and national partners in health care delivery to consider new organizational structures and processes that will assist them in optimizing their performance across the tripartite mission to benefit all Canadians.

To assist the leadership of AHSCs in this work, a National Task Force has been established that is comprised of nineteen leaders from across the country. The National Task Force has developed the report “Three Missions – One Future...Optimizing the Performance of Canada’s Academic Health Sciences Centres” to move the public policy discussion forward. In addition to the findings, the report contains eight recommendations, and a series of implementation strategies.

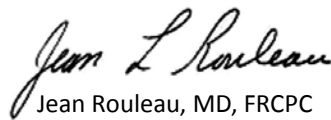
In our view, the objective of this report is to be a thoughtful reflection of the spectrum of issues and policy challenges we believe need to be addressed if Academic Health Sciences Centres and their evolution to “Networks” as they are defined in the report are to thrive for the foreseeable future, reach their full potential, and meet the changing health needs of Canadians – while working more collaboratively with those institutions that comprise the Academic Health Sciences Network, provincial and territorial governments, and the federal government.

In this regard, we sincerely hope that the report is a focal point for dialogue, and a catalyst for change.

Sincerely yours,



Jeffrey C. Lozon  
President & CEO, Revera  
Past-President & CEO, St. Michael’s Hospital



Jean Rouleau, MD, FRCPC  
Dean of Medicine, Université de Montréal





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The biographies of members of the National Task Force and the Steering Committee can be viewed on-line  
at [www.ahsc-ntf.org](http://www.ahsc-ntf.org).



## Who Should Read this Report

If this report is to play a constructive role in advancing a dialogue about optimizing the performance of Canada's Academic Health Sciences Centres (AHSCs), then the National Task Force believes that a broad cross-section of leaders must be effectively engaged in considering the findings, recommendations and implementation strategies in this document.

Leaders from the health, education, research & innovation sectors, governments, the private and charitable sectors all have an important interest in ensuring that AHSCs are well positioned to deliver on their missions and are of maximum benefit to Canadians and the global community.

With this in mind, we have identified a non-exhaustive list of local, provincial and territorial and national leaders who should read this report, reflect on its conclusions, and actively participate in the discussions with each other and with their own stakeholders, communities and governments about the future of Canada's AHSCs:

- University Presidents, Provosts, Vice-Presidents of Research and their Board of Governors and senior management teams;
- Deans of Medicine, Nursing, Pharmacy, Dentistry, Health Sciences and Rehabilitation Sciences, and their respective Vice-Deans of Education and Research;
- Presidents & CEOs of Academic Healthcare Organizations (including teaching, research and community-based hospitals, and long-term care and rehabilitation organizations), (academic) Provincial/Regional Health Authorities, Community-based and other regional-related Institutions, and their Board of Directors and senior management teams;
- Presidents & CEOs of Health Research Institutes, their Board of Directors, and Vice-Presidents of Health Research;
- Provincial, Territorial and Federal Ministers of Health, Education and Industry and senior government officials including deputy ministers and assistant deputy ministers;
- Presidents & CEOs of Federal, Provincial and Territorial regulatory bodies and their senior management teams;
- Presidents & CEOs from private industry and the health charity community and their senior management teams; and
- Presidents & CEOs of National Health Organizations and their Board of Directors and their senior management teams

We also recognize that there is a significant broader community of interest who should read the report and reflect on the path that is being recommended for Canada's AHSCs.

While these groups are among the most intimately involved in the dialogue, this report is germane to all professionals, educators, researchers, policymakers, patients and the public who are engaged in or concerned about the future of the academic health enterprise in Canada. We encourage you to read the report and consider its implications, at the local, regional, provincial, territorial and national level.



# Executive Summary

Recognizing that the health system is experiencing rapid change in times of economic challenge, the purpose of this report is to ensure that Canada's Academic Health Science Centres (AHSCs) are in a position to reach their potential and optimize their performance. This, however, presents both challenges and opportunities. Changes in governance and long-standing concerns about alignment of missions and resources have all put strains on the AHSC. At the same time, new approaches to patient care, teaching and research that are changing the traditional AHSC model offer the potential for significant benefits to patients and society as a whole.

These concerns and possibilities prompted 22 of Canada's national health provider and academic healthcare organizations to endorse and create the National Task Force on the Future of Canada's Academic Health Sciences Centres. The work of the task force, made up of 19 leaders in the Canadian and international academic health science community, was funded by Health Canada.

The terms of reference of the Task Force required it to identify the internal and external factors that will allow AHSCs to achieve excellence and innovation in patient care and service delivery, education, and research, and to recommend the means – including governance structures, accountability relationships and resource requirements – by which this should happen. Its mandate also called for setting out next steps for implementation of its recommendations.

Canada's Academic Health Sciences Centres (AHSCs) are comprised of a health sciences university's faculty of medicine, plus one or more health faculties or professional schools (including, nursing, pharmacy, dentistry, health sciences and rehabilitation sciences), colleges and other educational institutes, and their linkages to one or more academic healthcare organizations (including teaching and research hospitals and their research institutes, provincial and/or regional health authorities, rehabilitation institutions, specialty psychiatric centres, long-term care facilities, and nursing homes).

AHSCs deliver three related missions: (1) providing Canadians with timely access to advanced patient care services; (2) training the next generation of health care professionals; and (3) conducting leading-edge research and making it available to clinicians, administrators, policy makers and the public. It is the integration of patient care, education and research that uniquely defines the AHSC mission and differentiates it from other organizations in the health system that focus predominantly or exclusively on the provision of health and health care services. Each mission serves to reinforce the other two, with the objective of providing Canadians with access to world-class patient care, well-trained health care professionals, and state-of-the-art research.

This mandate positions AHSCs as engines of health innovation through the interplay between research, education and clinical practice which accelerates the translation of new knowledge into cost-effective leading practices, new models of organizing and delivering care, breakthrough drugs and/or medical devices that can revolutionize diagnosis, treatment and improve health outcomes.

The integration of education, research and patient care in the same milieu provides a fertile environment where students can learn and apply state-of-the-art knowledge from the classroom, to the laboratory, to the bedside. At the same time, AHSCs have a crucial role to play in converting new knowledge into a range of innovative products and services to the marketplace.

Through their strategic focus on innovation and knowledge translation, AHSCs have the potential to ensure that the health system remains accessible and flexible, and can rapidly adapt to changing health needs while placing it on a firmer fiscal foundation for the future. Knowing that the benefits that flow from Canada's AHSCs extend well beyond local, regional, and provincial and territorial boundaries, the National Task Force believes they should be acknowledged as a national resource in the system.

In carrying out its work and as required by its terms of reference, the Task Force drew on an extensive review of academic literature, an e-environmental scan, and in-depth interviews of health professional leaders across the country, as well as the experiences and knowledge of its own members. Through this process, the National Task Force identified three central themes that encapsulated AHSCs' challenges in fulfilling their current and future mission and mandate: (1) while *changing governance models* in the health system are sometimes acting as a catalyst for improved integration across all three missions of the AHSC, in other instances they are creating barriers; (2) *new integration mechanisms* are required, both within AHSCs and between AHSCs and government, to better align plans, strategies, processes and outcomes; and (3) *continued resourcing pressures*, uncoordinated funding, and multiple funding sources including the different levels of government, present a significant challenge to optimize all aspects of the care-teaching-research mission.

The Task Force has concluded that in order to optimize their performance and improve patient and population health outcomes it is essential to identify a common path forward for AHSCs that is clear, strategic and achievable. Moreover, such a common path is critical to the next step in their evolution: into Academic Health Science Networks (AHSNs).

At the same time, there is a significant responsibility for the AHSN community to improve the ways in which they are organized, governed and deliver their mission. We have also concluded that Canadians and their governments need to support AHSCs, and the networks into which they are evolving, because of their central role in the health care system.

Taking the path we have set out would strengthen a crucial pillar that supports the well-being of Canadians. It would enhance Canada's future well-being and prosperity by improving health and health outcomes, ensuring better educated health care professionals in Canada's future workforce, more effectively translating the benefits of research, innovation and commercialization, and identifying new opportunities and settings to introduce cost-effective innovations. Without acting now, Canada risks diminishing, if not losing, the value these organizations create together – value that in many cases has accumulated over more than a century.

## Evolution to Academic Health Sciences Networks (AHSNs)

With the emergence of new health care organizations with broad regional responsibilities for health as well as health care combined with emerging trends in academic medicine such as distributed medical education, eLearning, and collaborative inter-professional models of care across a broader range of organizations and institutions, the National Task Force embraced the new model of the Academic Health Sciences Network (AHSN), for which it developed the following definition: *“a set of formal partnerships created by health sciences universities, academic healthcare organizations and other provider organizations with the goal of improving patient and population health outcomes through mechanisms and structures that develop, implement and advance integrated health services delivery, professional education, and research and innovation. At the core of this network is the AHSC, working closely with other academic healthcare organizations who focus, in whole or in part, on the care-teaching-research mandate.”*

The National Task Force believes that Canada's health sciences universities, colleges and other educational institutes, and the academic healthcare organizations with which they have formal affiliation agreements will continue to constitute the critical nuclei of these emerging networks. However, we have also concluded that a more contemporary and inclusive definition is needed that builds on the traditional core mission and mandate of the AHSC and also accurately reflects the new relationships that are emerging among a variety of health services organizations working together on the some or all of the components of the care-teaching-research mandate.

Using this definition, there are 17 AHSNs in Canada at present, one centered on each of the country's university medical schools and at least one affiliated teaching/research hospital.

To guide subsequent discussions at the local level as to who should be a member of the Network, the National Task Force highlighted four models across the country as possible examples: *les Réseaux Universitaires Intégrés de Santé* (RUIS); the Toronto Academic Health Sciences Network (TAHSN); the Saskatchewan Academic Health Sciences Network (SAHSN); and the British Columbia Academic Health Sciences Council (BCAHC).

At the same time, the National Task Force also identified some of the issues and challenges that AHSNs will need to reflect on, and proposed a series of metrics that capture a range of outcomes produced by the AHSN and more clearly articulate its overall value proposition.

## AHSN Vision

Looking forward, the National Task Force saw a clear need to define the future vision for Canada's AHSNs. This vision should build on the existing leadership role in academic networking of today's AHSCs, ensure that they achieve the same or a greater degree of international recognition, and like them are able to attract and retain the world's best health practitioners, educators and researchers. The vision is as follows: *“Academic Health Sciences Networks (AHSNs) will improve the health of Canadians and enable Canada to be a global leader in health care, education and research.”*

To fulfill this vision and enable the evolution from the traditional AHSC model, the National Task Force concluded that these new networks must be appropriately structured, mandated, governed, resourced and enabled.

## Recommendations to Optimize the Performance of AHSN

The National Task Force strongly believes that the recommendations set out in this report are key to transforming the structure of the AHSN and placing it on a path of superior performance and long-term sustainability, and providing the greatest value possible for Canada and Canadians. High-level implementation strategies for each recommendation are set out in Chapter 7.

### The AHSN Community...

To think and act like cohesive organizations delivering their missions and commitments, AHSNs need to develop new organizational frameworks to facilitate planning, priority-setting, resource allocation and decision-making. The National Task Force believes that we can learn from some of the recent inter-organizational structures that have been introduced in Quebec, Ontario, Saskatchewan and British Columbia.

#### Recommendation 1

*“The National Task Force recommends that all Academic Health Sciences Networks (AHSNs) establish formal inter-organizational structures and governance mechanisms to support the development of integrated strategies, plans and policies, and ensure more effective planning, information-sharing, coordinated decision-making and policy implementation.”*

Fully embracing the network model will require a diverse array of health care organizations to recognize and accept a more collective responsibility for leadership in delivering on the care-teaching-research mission. This shift can take place only if it is backed up with mechanisms that recognize the single-entity nature of the AHSN and support integration and planning across it.

#### Recommendation 2

*The National Task Force recommends that each of Canada’s Academic Health Sciences Networks (AHSNs) commit to developing integrated plans and strategies that will:*

- a. Guide its overall process of transforming to the network model;*
- b. Achieve the vision of the AHSN set out in this report (which is “to improve the health of Canadians and enable Canada to be a global leader in health care, education, and research”) by:*
  - leading the development of innovative and value-added health care services, education and research, evaluation and knowledge translation,*
  - accelerating the dissemination of research-based evidence into clinical practice to implement leading practices to enhance the quality, accessibility and affordability of health care services and improve patient and population health outcomes, and*
  - integrating innovative collaborative models of education with health care delivery and research; and*
- c. Identify appropriate performance measures to assist in monitoring their progress and performance.*

Because AHSNs are relatively new, and developing in a rapidly changing environment, it would be valuable to leverage existing national mechanisms, such as those provided by national health organizations, to meet on a regular basis to exchange information, lessons learned, and leading practices; review the structural design of AHSNs and their strategic objectives; and consider the breadth of metrics to express their impact.

### Recommendation 3

*“The National Task Force recommends that the relevant national associations establish the appropriate structures, processes and forums for Canada’s AHSNs to meet on a regular basis. The objectives of these meetings would be: (1) to strengthen AHSN relationships; (2) to identify gaps or duplication in their mandates, plans, policies and/or programs; and (3) to share lessons learned and leading practices.”*

The National Task Force was strongly of the view that all of Canada’s emerging AHSNs need to better communicate and promote their value, an exercise which some have already undertaken. This would involve creating an appropriate brand for a number of target audiences, including the public, media, governments, healthcare organizations, the charitable sector and the private sector.

#### **Working With Governments...**

Like AHSCs, AHSNs are involved in a complex set of relationships with Canada’s provincial/territorial and federal governments. Responsibility for the delivery of health services and post-secondary education rests with the provincial and territorial governments, which generally also provide some of the funding for research and innovation, along with a series of direct and indirect investments in health care, education and research, innovation and commercialization by the federal government that are complementary in nature.

Each provincial and territorial government has its own model for supporting and overseeing the organizations that deliver the care-teaching-research mission of the AHSN. Typically, responsibilities are spread across a number of ministries. This risks reducing the ability of AHSNs to successfully achieve their missions and fully benefit the communities they serve. Indeed, health care leaders interviewed for the National Task Force’s work frequently identified problems with competing agendas, conflicting policies and fragmented priorities.

The introduction of new AHSN-inter-Ministerial mechanisms would improve the alignment of activities across AHSNs, allowing for a more complete discussion of their accountabilities and deliverables, and examine ways of fully leveraging resources invested in them. The results would include less duplication of effort, improved policy coverage of key issues, better integration of policies, and greater return-on-investments in our health care system.

### Recommendation 4

*“The National Task Force recommends that AHSNs work with their respective provincial and territorial governments to create mechanisms through which AHSNs and all relevant ministries can more effectively communicate, share information and make decisions, and develop, coordinate and implement policies.”*

At the federal level, the government directly provides close to 80 cents of each public dollar invested in health research, as well as making transfer payments to provinces and territories for their health and education priorities. Given the range of areas in which the federal government can support and complement the role of the provinces and territories, and the national impact of AHSNs, the National Task Force identified a need to improve policy consultation and coordination with the national organizations that represent AHSNs.

In considering a mechanism for consultation and dialogue at the federal level that supports the AHSN, the National Task Force would make it clear that this is in no way intended to supplant or diminish the constitutional responsibilities of the provinces and territories. Where there is an identified role for the federal government to invest in the tripartite mission of AHSNs, it must be done in close consultation with the provinces and territories and aligned with their priorities. The National Task Force is sensitive to the added complexity that is associated in establishing a mechanism that extends across two levels of government.

### Recommendation 5

*“The National Task Force recommends that the federal, provincial and territorial governments collectively recognize AHSNs as a national resource in the health system by working with the relevant national associations and bodies to create mechanisms through which AHSNs and federal ministries and agencies can more effectively communicate, share information and make decisions, and develop, coordinate and implement policies.”*



Thus far, the recommendations have focused on the need to develop integrated plans and strategies and effectively align structures within and between AHSNs and with relevant government bodies to improve patient and population health outcomes. While these priorities are vital to the future of the AHSN, they cannot be disconnected from a discussion on resourcing the elements that underpin the AHSN enterprise: patient care; education; research; and infrastructure – with the provinces and territories playing a primary role in terms of overall stewardship, funding and accountability.

The National Task Force believes that AHSNs should be able to demonstrate the value they achieve with the funding they receive, which is often criticized and to some degree misunderstood for being higher compared to community health provider organizations. Including performance measures in their plans, as we have recommended, AHSNs will continue to demonstrate that they accept their accountability for wise and responsible stewardship of public funds and scarce resources.

Funders must also recognize and begin to address significant and legitimate resource problems among AHSNs and their members. Funding concerns – lack of alignment, fragmentation and in some instances inadequacy – together make up perhaps the biggest challenge they face. As provinces and territories seek to contain the growth of health care costs, AHSNs will need to work closely with their funding partners to address this challenge in ways that support better health and health care outcomes.

### **Recommendation 6**

*“The National Task Force recommends that AHSNs and provincial and territorial governments ensure that the appropriate financial resources, mechanisms and programs are aligned to fulfill their agreed upon missions.”*

While provincial and territorial governments are the predominant funder of AHSNs, it will also be crucial to find ways in which investments by the federal government are aligned with local care-teaching-research priorities to provide maximum value. Regardless of the funding mechanism, discussions would be required among the federal, provincial and territorial governments and AHSNs to determine how any funding arrangement would effectively work and meet pre-determined common policy objectives.

### **Recommendation 7**

*“The National Task Force recommends that AHSNs and the federal government, in close consultation and ongoing dialogue with the provinces and territories, ensure the appropriate federal financial resources, mechanisms and programs are aligned with provincial and territorial government priorities, to fulfill their agreed missions.”*

### **AHSNs and the International Community...**

Canada’s reputation for excellence in delivering on the care-teaching-research mission and as an “honest broker” positions it well to assume an international leadership role in advancing the AHSN concept. Inviting the best and brightest minds in the world to regularly share experiences, leading practices and lessons learned, and thoughts about structures and processes would help to enrich Canadian AHSNs and further contribute to Canada’s international stature.

The National Task Force believes that implementation of the recommendation is an enabler to the vision we propose and would ensure that Canada’s AHSNs are relevant, globally competitive, and properly positioned internationally to contribute our experiences to improving health, health care and health systems worldwide, and also benefit from the knowledge and leading practices developed elsewhere.

### **Recommendation 8**

*“The National Task Force recommends that Canada’s Academic Health Sciences Networks and their national organizations create an international meeting place, or host an annual forum, that brings together global leaders committed to the collective advancement of the issues and opportunities in the academic health sciences.”*



# 1. Introduction

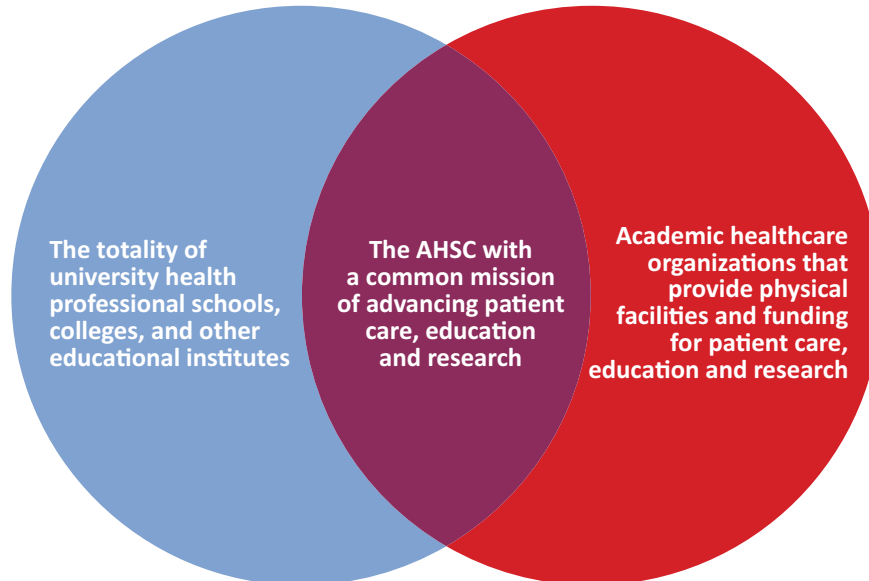
The serious and growing pressures on Canada’s health care system are well known. In 1999, Dr. David Naylor, now President of the University of Toronto, coined the term the “Impossible Triad” to describe them:<sup>1</sup> the need to provide quality care and better access to services while keeping the system affordable.

Canada’s academic health science centres (AHSCs) hold a unique position in the health care system, one that has the potential to help achieve this balance. Although the term is relatively new, the roots of these centres go back to the 19th century, when the links between hospitals and medical schools were first forged.

Today, AHSCs involve universities and their faculties of medicine, nursing, pharmacy, dentistry, health sciences and rehabilitation sciences, colleges and other educational institutes, and their linkages to academic healthcare organizations, including teaching and research hospitals and their research institutes,<sup>2</sup> provincial and/or regional health authorities, rehabilitation institutions, specialty psychiatric centres, long-term care facilities, and nursing homes. Providing a formal term for them reflects a growing focus on the crucial roles that they play: providing the highest levels of front-line care, training Canada’s future health-care professionals, and putting research findings to work.

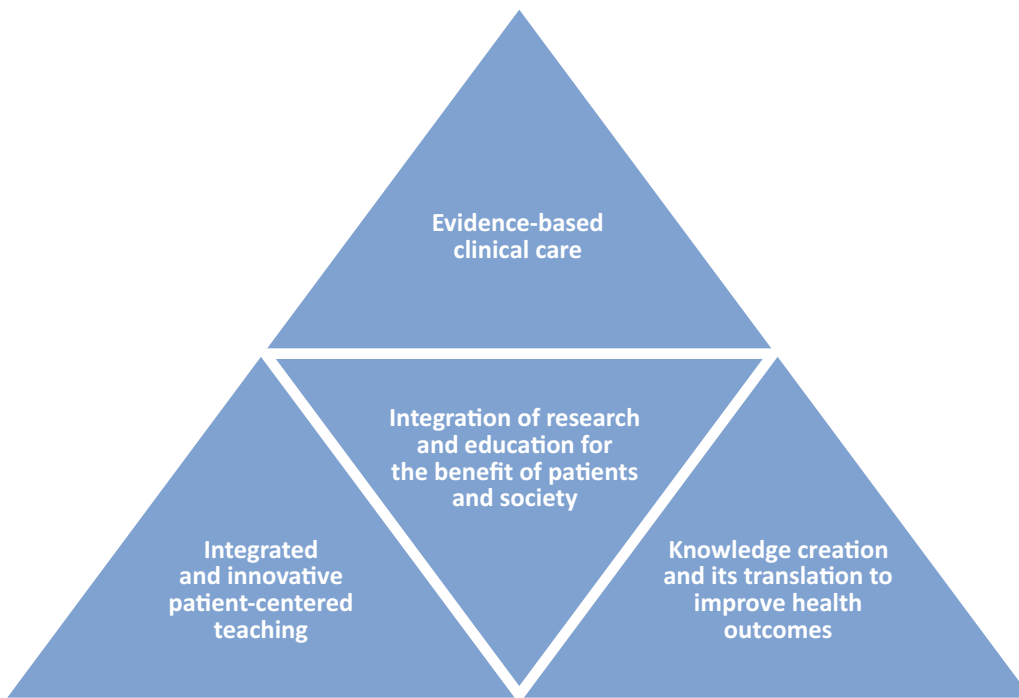
With this new focus has also come recognition of the value AHSCs provide, in particular the synergies that arise when health-care educators, students, highly skilled practitioners and researchers work closely in concert (see Figure 1). This, in turn, points the way forward to the role that they can play in helping to balance the competing pressures in health care. Because they are at the nexus of so many key activities, AHSCs have the potential to discover and apply innovations that could improve patient and population health outcomes, enhance the benefits of research, innovation and commercialization, and make the system as a whole more cost-effective.

**Figure 1**  
**The Mission of Canada’s Academic Health Sciences Centres (AHSCs)**



It is the *integration* of patient care, education and research that uniquely defines the AHSC mission and differentiates it from other organizations in the health system that focus predominantly or exclusively on the provision of health and health care services. Each mission serves to reinforce the other two, with the objective of providing Canadians with access to world-class patient care, well-trained health care professionals, and state-of-the-art research (see Figure 2).

**Figure 2**  
**The Integrated Missions of the AHSC and its Impact on Health, Health Care and Innovation<sup>3</sup>**



This mandate positions AHSCs as engines of health innovation through the interplay between research, education and clinical practice which accelerates the translation of new knowledge into cost-effective leading practices, new models of organizing and delivering care, breakthrough drugs and/or medical devices that can revolutionize diagnosis, treatment and improve health outcomes.

The integration of education, research and patient care in the same milieu provides a fertile environment where students can learn and apply state-of-the art knowledge from the classroom, to the laboratory, to the bedside. This integration also favours the application of the best available evidence in practice, leading to better health outcomes for patients and populations, and improved utilization of health care resources that contribute to the sustainability of the health system.

Through their strategic focus on innovation and knowledge translation, AHSCs have the potential to ensure that the health system remains accessible, flexible and sustainable, and can rapidly adapt to changing health needs while placing it on a firmer fiscal foundation for the future. Leveraging investments in health research can also contribute to long-term economic prosperity. Knowing that the benefits that flow from Canada's AHSCs extend well beyond local, regional, and provincial and territorial boundaries, we believe they should be acknowledged as a national resource in the health care system.

These goals cannot be achieved, however, without a better understanding of the current roles and missions of these centres, their governance, the impacts of rapid changes in the Canadian health care system on them, and the internal or external obstacles they may face to achieving their goals.

Recognizing the major benefits to be gained, 22 national health organizations unanimously supported the setting up of a National Task Force on Canada's academic health sciences centres. Appendix A lists the 22 organizations. Supported largely by a grant and encouragement from Health Canada, the National Task Force had the following terms of reference:

1. To draw on international experiences and lessons to identify the internal and external factors that need to be addressed to allow AHSCs (at the individual and collective level) to achieve excellence and innovation in patient care and service delivery, education, and research;
2. To undertake a survey and thorough assessment (e.g., environmental scan) of the perspectives of AHSCs, governments and the public across Canada;

3. To recommend new conceptual frameworks and typologies for AHSCs in Canada to better align their mission in service delivery, education and research with the changing approaches to health and health care delivery, changing expectations for interdisciplinary education and new opportunities for innovation through research;
4. To review and make recommendations on the future accountability relationships, governance, structural and resource requirements of AHSCs consistent with their evolving roles and responsibilities;
5. To review and make recommendations on how those who fund AHSCs, in particular the provinces, territories and federal government, can achieve the greatest benefits from their investments and sustain AHSCs as resources that advance the health of Canadians; and
6. To identify next steps and proposed implementation strategies.

In acting on these terms of reference, the National Task Force was well aware that the Canadian health care system has been the subject of a number of national, federal, provincial and territorial reviews and studies in recent years. All of these have contributed to the dialogue around the financing, organization, management, delivery and evaluation of health and health care services in Canada.<sup>4</sup>

While these reports consider carefully the key issues facing the health care system,<sup>5</sup> they have been linked in only a limited fashion to one another. More critically from our perspective, they have not consistently discussed or described the role, mission or mandate of Canada's AHSCs in the system as a whole.<sup>6</sup>

Yet the "triple promise" of the AHSC – providing advanced patient care, educating the next generation of health professionals, and supporting research, medical discoveries and knowledge translation – is vital to Canada's health system. And it is only within the AHSC that these key pieces of the health care system are brought together simultaneously and synergistically. This makes them an essential cornerstone of the health system. Because they serve local health populations directly while carrying out their broader training and research roles, AHSCs also constitute a resource for communities, regions, provinces and territories, as well as having an impact at the national level. For these reasons, an in-depth look at Canada's AHSCs was not just warranted, but long overdue.

Our response to our terms of reference, particularly the eight recommendations set out in this report, represent a *national call to action* that would sharpen the strategic focus on the future roles, responsibilities and evolution of Canada's AHSCs. This focus needs to be based on the long-term goal for all health organizations, which is to achieve an effective balance of quality of care, access to the system, and affordability, while reflecting the values of the people who rely on their services; ultimately improving the health of all Canadians.

We have concluded that it is essential to identify a common path forward for AHSCs that is clear, strategic and achievable. Moreover, such a common path is critical to the next step in their evolution: into Academic Health Science Networks (AHSNs). This evolution and, through it, the enhanced delivery of the triple promise represent the "One Future" in the title of this report. The following chapters lay out in more detail how we believe this future can be ensured.

We have also concluded that Canadians and their governments need to support academic health science centres, and the networks into which they are evolving, because of their central role in the health care system. At the same time, there is a significant responsibility on these bodies individually and collectively to improve the ways in which they are organized, governed and deliver on their mission.

Taking the path we have set out would strengthen a crucial pillar that supports the well-being of Canadians. It would enhance Canada's future well-being and prosperity by improving health and health outcomes, ensuring better educated health care professionals in Canada's future workforce, more effectively translating the benefits of research, innovation and commercialization, and identifying new opportunities and settings to introduce cost-effective innovations. Without acting now, Canada risks diminishing, if not losing, the value these organizations create together – value that in many cases has accumulated over more than a century.

## 2. Defining the Issues and Challenges

In responding to our terms of reference, we set out several questions to frame the issues and challenges facing Canada's AHSCs. The questions, which follow, and the responses we received drove the structure of the report. Deciding on the right questions also played a strategic role in our deliberations and the research we commissioned.

The questions:

1. Is there consensus on a working definition of an Academic Health Sciences Centre in the Canadian context?
2. Does the definition of an AHSC need to be reconsidered or amended in light of the reforms that have been introduced into the health system, and the innovative ways in which health services are structured and delivered, education is provided, and the manner in which health research is conducted and translated across a broader array of healthcare organizations?
3. Can a "value proposition" be articulated surrounding the multiple dimensions that academic health sciences centres offer?
4. What vision of the AHSC, now and into the future, can be developed?
5. Given the growing number of healthcare organizations that are delivering, in whole or in part, on the AHSC mission and mandate, do AHSCs need to develop integrated plans and strategies?
6. Do AHSC governance structures between universities and academic healthcare organizations optimally support the execution of the AHSC mission?
7. Given the breadth of the AHSC mission, can new consultative mechanisms with provincial and territorial governments, and the federal government be created?
8. How are the missions of the AHSC to be resourced at appropriate levels?
9. What new mechanisms does Canada require to support and promote increased international dialogue on AHSCs?

To help us better understand the issues and challenges facing AHSCs in Canada and internationally, we commissioned two pieces of background research – an environmental scan and a case study. These reports are available on the NTF web-site at [www.ahsc-ntf.org](http://www.ahsc-ntf.org).

### 2.1 Environmental Scan

The goals of the environmental scan were to:

1. Identify the external and internal factors (including enablers and barriers) that need to be addressed to allow AHSCs to achieve excellence and innovation in patient care and service delivery, education and training, and research and innovation; and
2. Identify and understand the perspectives of AHSCs, governments and the public across Canada on the changing needs of AHSCs.

The Environmental Scan<sup>7</sup> comprised three activities:

- A report on attitudes collected through an e-survey of health care sector leaders from across Canada. These included senior members of the institutional, academic, government and research communities. Respondents provided input in four areas: (1) patient care and services delivery; (2) education and training; (3) research and innovation, and (4) AHSC governance structure. Invitations to complete the on-line survey were sent to 280 individuals or organizations. The response rate was 43.5%, or 124 completed questionnaires.
- Twenty-five key informant interviews undertaken to generate more in-depth understanding of the e-survey findings.
- An international literature review covering roughly 1,000 articles, reports and web-sites. Summary abstracts of 170 of the most relevant documents published between 1994 and 2009 were prepared. The focus was on eight overarching themes: (1) accessibility; (2) accountability; (3) excellence; (4) innovation and knowledge transfer; (5) interdependence and collaboration; (6) inter-disciplinary; (7) quality; and (8) sustainability.

## 2.2 Case Studies

The case study<sup>8</sup> leveraged a series of structured interviews with key stakeholder to help assess AHSC models across the country, identifying both similarities and differences. The report on the case study, looks at various governance models between universities and healthcare delivery organizations, and at the mechanisms between the AHSCs and governments through which the integrated mandate of the AHSC is delivered. The report provides insight on leadership, management structures and processes, and how decisions on joint faculty and clinical appointments are made.

The report also highlights challenges in delivering on the AHSC mandate, including those related to: distributed education models; delivery of care and health human resources; emerging issues related to education and training, and research mandates. The report also identifies a number of provincial, territorial and federal challenges related to the resourcing of AHSCs.

## 2.3 Additional Input and Feedback

In addition to the background research that was commissioned, we also solicited feedback on earlier drafts of the report and the preliminary recommendations and the proposed implementation strategies through three sequenced processes:

- Meeting with representatives of the federal, provincial and territorial governments; the 22 national health organizations that were initially supportive of this process, and other meetings on request;
- A web questionnaire that was completed in advance as well as after the AHSC National Symposium that was held on January 28-29, 2010; and
- Direct input that was received at the AHSC National Symposium where over 90 senior leaders from across the health system were in attendance.<sup>9</sup>

## 2.4 Emerging Themes

The environmental scan, case study and additional input and feedback gave us essential information to supplement the individual experiences of members who work as leaders in various aspects of the AHSC system in Canada, internationally, or both.

We identified the following three central themes that encapsulated AHSCs' challenges in fulfilling their current and future mission and mandate:

1. While *changing governance models* in the health system are sometimes acting as a catalyst for improved integration across all three missions of the AHSC, in other instances they are creating barriers.
2. *New integration mechanisms* are required, both within AHSCs and between AHSCs and government, to better align plans, strategies, processes and outcomes.
3. *Continued resourcing pressures*, uncoordinated funding, and multiple funding sources including the different levels of government, present a significant challenge to optimize all aspects of the care-teaching-research mission.

## 3. History and Evolution

### 3.1 The Genesis and Definition of the Academic Health Sciences Centre

What we today call a teaching hospital – which is central to our modern idea of an AHSC – did not exist in the 19<sup>th</sup> century.<sup>10</sup> Medical schools at that time had loose affiliations with local hospitals, but the schools were restricted in how they could use hospital facilities for teaching purposes. Medical schools did not appoint the hospital staff, and there was little assurance that hospital-based physicians had both academic and clinical credentials. Medical faculties were seldom permitted to engage in clinical research, and medical students were rarely allowed to work in hospital wards to gain practical, hands-on clinical experience to complement their medical school education.

The major exception was Johns Hopkins Hospital, which opened in 1889 and was conceived as a teaching institution from its inception. The success of the Johns Hopkins Hospital model led other large hospitals to adopt a similar model. Abraham Flexner's 1910 report for the Carnegie Foundation on medical education in the United States and Canada laid the foundation of the tripartite mission of the AHSC – patient care, education and research.<sup>11</sup> The report envisioned a clinical phase of education that would be conducted at academically oriented hospitals. This would also allow thoughtful clinicians to pursue research questions that arose from the treatment of patients and teach their students to do the same.

With the impetus provided by Flexner's report, by the 1920s the model for the modern teaching hospital as we understand it today was flourishing. It continued to evolve after the Second World War with a renewed focus on research, which alongside education emerged as the dominant and defining characteristic of successful teaching hospitals in the United States and Canada.<sup>12</sup>

For much of this period, the relationship was essentially one-to-one: that is, a university medical school linked to a teaching hospital. The most recent evolution has been adoption of the term "Academic Health Sciences Centre" to recognize the broader scope of modern teaching, research and patient care institutions and their relationships.

In Canada, the term is often used to describe institutions as well as the partnerships among them. An AHSC typically involves a health sciences university with a faculty of medicine plus at least one more other health professional program or faculty (nursing, dentistry, pharmacy, health sciences, rehabilitation sciences, psychology and so on), colleges and other educational institutes, and one or more "academic healthcare organizations." An academic health care organization is an institution at which care is delivered, health care professionals are educated and health research is undertaken, and includes teaching hospitals, research hospitals, provincial or regional health authorities, rehabilitation institutions, specialty psychiatric centres, long-term care facilities, nursing homes and so on, and their affiliated research institutes.<sup>13</sup>

There is considerable variability among individual AHSCs in Canada, each of which necessarily reflects the social, political, geographic, cultural, and economic context in which it developed.<sup>14</sup> In other words, when you have seen one AHSC, you have seen just one AHSC. Is it possible, nonetheless, to agree on a working definition that captures the generic structures, relationships and missions of an AHSC in the Canadian context?

Although various definitions exist, we put forward the following working definition of the "Academic Health Science Centre" from the Canadian literature: "AHSCs in Canada are health care institutions that are affiliated with universities that have health professions schools including a medical school. In partnership with the university the role of the AHSC is to educate health professionals, in a clinical care setting, to provide clinical care (particularly complex, specialized tertiary and quaternary care) and to undertake research that will continue to improve health and healthcare."<sup>15</sup>

Typically, the organizations involved in the AHSC:<sup>16</sup>

- Understand that their missions and mandates are all interdependent and interlocking;
- Recognize that while a teaching hospital provides care, it is also a hospital for teaching, and similarly that while a research hospital provides care, it is also a hospital where research is conducted;
- Formally recognize each party's roles, responsibilities and obligations to one another through a document known as an "affiliation agreement";



- Use existing joint structures and processes designed to help the parties achieve their stated missions, goals and objectives, and resolve any conflicts between them;
- Formally undertake that all, or a majority, of clinical faculty and all clinical leaders will be jointly selected and appointed by the university and the respective academic healthcare organization(s); and
- Base inter-organizational alignment on a recognition of the essential and roughly equivalent strength of partner institutions.

In reflecting on the AHSC definition in the Canadian context, we noted that:

- In practice, an AHSC is not a single, stand-alone organization, but rather at least two entities (a university that has a medical school and an academic healthcare organization) that work in close strategic partnership.
- The term “AHSC” might leave the impression that there is one physical structure or site where a university’s health professional faculties are close to an academic healthcare organization. The reality, however, is that AHSC assets and activities are generally located at several sites. As a result, the pieces of an AHSC are linked or networked to one another, and may be spread across a defined geographical region.
- While universities’ health professional faculties and academic healthcare organizations are inseparable partners in fulfilling the AHSC mission and mandate:
  - They are bound by different legislative and regulatory provisions, have different requirements for governance, management structure and reporting, use differing structures and processes to accomplish their respective roles and responsibilities, and generally have different cultures; and
  - They are accountable to differing funding sources.

Finally, the variation in models from province to province reflects the constitutional reality that matters related to health care delivery and post-secondary education do not fall under federal jurisdiction and have evolved in ways that best respond to local, regional and/or provincial and territorial circumstances and priorities. The result is a national framework with 13 different health care systems linked to 13 different education systems.

## 3.2 Size and Scope

To this point, we have focused on the roles and responsibilities of Canada’s AHSCs, with no reference to their size and scope. To provide additional context for the remainder of the report we provide an order-of-magnitude statistical overview of the current AHSC landscape by focussing on a select number of indicators.<sup>17</sup>

Drawn from published, unpublished and forthcoming publications, these indicators – some of which are estimates – briefly describe AHSCs in the following dimensions: (1) funding, training and health system capacity; (2) providers of complex and rare patient care across the continuum; and (3) engines of research, innovation and commercialization.<sup>18</sup> In our view, more work needs to be undertaken to more accurately capture the full statistical dimensions (i.e., patient care, teaching and research) of the AHSC enterprise at the national level.

### Funding, Training and Health System Capacity

As of 2009 the estimated total operating budgets of the 57 healthcare organizations (see Table 5) that fit our definition of an AHSC is in the range of \$24 Billion. If fee-for-service earnings for those physicians who work in AHSCs are included, the figure increases to approximately \$34.5 Billion.<sup>19</sup> The annual number of outpatient clinic and day hospital visits is estimated at 14.8 million and emergency department visits is estimated at 5.4 million.

There are approximately 1.4 million hospital admissions per year, and the total number of hospital beds is approximately 48,000. Finally, it is estimated that the corporations in which the AHSCs are contained employ close to 355,000 people and benefit from the contributions of close to 53,000 volunteers (see Table 1).

Each year, AHSCs provide close to 55,000 clinical placement opportunities across multiple professions (including for example, medicine, nursing, dentistry, physiotherapy, occupational therapy, speech pathology, audiology, respiratory therapy, nutrition and dietetics, laboratory sciences and others).<sup>20</sup> Of the 18,500 students from the most common health professions that graduate annually, many will work in a hospital (25%), and nearly all of the

students will have had or will enter a clinical placement or a residency.<sup>21</sup> These opportunities, depending on the profession, jurisdiction and regulation can be a prerequisite for either graduation or licensure. Many of these opportunities are coordinated through the academic healthcare organizations that collaborate with the University, College or educational institute.<sup>22</sup> Upon entry, there are 85,000 students who are in a university health profession programme.

CATEGORY	TOTAL
Estimated total operating budgets of AHSC group (2008/09) <sup>23</sup>	\$24,000,000,000
Number of outpatient visits per year (2010) <sup>24</sup>	14,800,000
Number of emergency department visits per year (2010) <sup>25</sup>	5,400,000
Number of hospital admissions (2010) <sup>26</sup>	1,400,000
Number of hospital beds (2008/09) <sup>27</sup>	48,000
Number of employees (2008/09) <sup>28</sup>	355,000
Number of volunteers (2008/09) <sup>29</sup>	53,000
Number of clinical trainees/placements – multiple health professions (2008/09) <sup>30</sup>	55,000
Number of annual graduates from health professions (2007) <sup>31</sup>	18,500
Students enrolled in a First Year University health profession programme (2007) <sup>32</sup>	85,000

### **Providers of Rare & Complex Patient Care**

One of the unique features of the AHSC, given the combination of specialized clinical expertise and medical technology, is the degree to which they provide a range of procedures that are exceptionally complex, rare and costly – such as organ transplants, care for trauma patients, and life saving surgery for neonatal infants (see Table 2).<sup>33</sup> These procedures are in addition to the range of primary and secondary services that are also provided. For example, approximately 97% of the care for 12 rare & complex conditions are provided in teaching and research hospitals.<sup>34</sup>

<b>CASE MIX GROUPS</b>	<b>% OF CASES BY AHSCS</b>
Fetal surgery	100%
Heart or lung transplant	100%
Liver transplant	97%
Treatment of concurrent hip fracture and head injury	94%
Treatment of concurrent spinal cord injury and chest and/or abdominal procedure	93%
Neonatal infant (birthweight 1500-1999 grams) catastrophic diagnosis	92%
Neonatal infant (birthweight 1000-1499 grams) catastrophic diagnosis	90%
Neonatal infant (birthweight 2000-2499 grams) catastrophic diagnosis	85%
Treatment of concurrent spinal cord and head injury	83%
Other musculoskeletal infections	66%
Non-extensive burn with wound procedures	62%
Neonatal infant (less than 6 days) with catastrophic diagnosis	60%

At the same time, AHSCs relative to community hospitals of comparable size, provide care to a greater proportion of patients who: (1) have a higher complexity score (i.e. patients who fall into the Canadian Institute of Health Information's two most complex patient categorization (Plx™) groups which represents a combination of diagnosis, age, and co-morbidity factors); (2) patients who are transferred from another facility (i.e. who need the services that due to the nature of their condition may not be available locally or in a community hospital); and (3) who have conditions that are known to significantly increase the cost of their hospital stay (i.e. they have one or more flagged condition as identified by CIHI as causing a significant increase in cost per case) (see Table 3).<sup>36</sup>

<b>CATEGORY</b>	<b>AHSC (TEACHING &amp; RESEARCH) HOSPITALS<sup>38</sup></b>	<b>LARGE (SIMILAR SIZE) COMMUNITY HOSPITALS<sup>39</sup></b>
% of all patients in two most complex patient groups	56%	33%
% of patients transferred from another hospital	12%	7%
% of all patients with at least one flagged intervention	11%	6%

While the number and mix of complex patients increases the cost per case,<sup>40</sup> the advantages of consolidating these services are: (1) organizations achieve critical mass which has been shown to result in better outcomes;<sup>41</sup> (2) it reduces or can eliminate the need to reserve excess or stand-by capacity for rare conditions in multiple sites; and (3) it reduces inter-organizational competition for scarce human resources, technology and infrastructure.

**Engines of Research, Innovation & Commercialization**

AHSCs in Canada play a crucial role in the health research, innovation and commercialization enterprise. AHSCs account for over \$1.8 billion dollars of research revenues. In 2007-2008, the research budgets of these organizations paid salaries for a minimum of 55,000 individuals including at least 2,761 scientists for whom the AHSC is the primary academic affiliation. Approximately 60% of these scientists are clinician scientists who hold joint clinical and research responsibilities.

The scientists for whom these organizations are the primary academic affiliation, also provide direct supervision to a minimum of 2,570 PhD and Masters students. This does not include the students for whom they provide committee member support. In addition, there are at least 1,644 post-doctoral researchers. In total, they generate a minimum of 11,000 peer reviewed publications based on 2007/08 data and a minimum of 1,600 new clinical trials worth over \$338 million dollars. The ethics review offices of these organizations, receive close to 9,000 new ethics review submissions per year.

From the end of the 19th century AHSCs accounted for more than 100 world first medical discoveries over 50 of which occurred between 2000 and 2006 (Appendix B). From 1996 to 2006 more than 70+ spin-off companies (Appendix C) as well as multiple peer-reviewed publications, licenses, patents, and disclosures were produced. Table 4 provides a summary and references/sources of these and other estimates.

CATEGORY	TOTAL
Total research budgets of AHSC group (2009) <sup>42</sup>	\$1,800,000,000
Minimum dollar value of new clinical trials (2007/08) <sup>43</sup>	\$338,000,000
Total technology transfer income (2003/06) <sup>44</sup>	\$27,000,000
Total license income (2003/06) <sup>45</sup>	\$5,000,000
Minimum number of employees paid from research budgets (2007/08) <sup>46</sup>	55,000
Minimum number of peer reviewed publications (2007/08) <sup>47</sup>	11,000
Minimum number of new research ethics submissions (2007/08) <sup>48</sup>	8,900
Minimum total number of new clinical trials (2007/08) <sup>49</sup>	1,600
Minimum number of researchers for whom AHSC is primary affiliation (2007/08) <sup>50</sup>	2,791
Minimum number of post doc researchers (2007/08) <sup>51</sup>	1,644
Minimum number of PhD & MSc candidates supervised by AHSC scientist/researcher (2007/08) <sup>52</sup>	2,570
Minimum number of disclosures (2007/08) <sup>53</sup>	415
Minimum number of patents issued (2007/08) <sup>54</sup>	312
Minimum number of new spin-off companies (2007/08) <sup>55</sup>	65
Minimum number of licenses (2007/08) <sup>56</sup>	217

### 3.3 The Evolution to Academic Health Sciences Networks (AHSNs)

The traditional model discussed above – health sciences university linked to teaching hospital – was marked, from its inception, by symbiosis, co-dependency and partnership. Medical schools understood that access to patients and the wards of hospitals was essential for clinical education and patient-based research. Teaching health care organizations recognized that their reputations and missions were inextricably linked to those of their affiliated health sciences universities that allowed them to take part in medical education and health research.<sup>57</sup>

While health sciences universities and hospitals in Canada continue to recognize and work together to realize those mutual benefits, the context around their relationship is changing. Sweeping changes have taken place in the relationships at the heart of the AHSC in recent years, as well as to all three elements of the care-teaching-research mandate.

Each health science university today has affiliations with multiple health care organizations. This is perhaps best illustrated by the fact that while there are 17 health sciences universities with medical schools in Canada, there are close to 40 members of the Association of Canadian Academic Healthcare Organizations (ACAHO) who have as their central missions advanced patient care, teaching and research (see Table 5).<sup>58</sup> Some members of ACAHO are individual teaching and/or research hospitals or non-acute care institutions who are AHSCs, while others are provincial or regional health authorities that include traditional teaching and/or research hospitals, and their research institutes, rehabilitation institutes, specialty psychiatric centres, long-term care facilities and nursing homes within their organizational structure.

As well, patterns of practice and health care delivery are changing in the AHSC environment and elsewhere. Driven both by an effort to improve outcomes and the need to address looming health human resource challenges, collaborative team-based care is becoming the norm, whether in the operating room, at the nursing station, in the outpatient clinic or in the family physician's practice. Scopes of practice are changing, leading to different decision-making processes. New providers, such as physician assistants and others, are being trained and deployed. Traditional hierarchies are being challenged. Examples of inter-professional educational initiatives across the country include:<sup>59</sup>

- The Inter-professional Education for Collaborative Patient-Centered Practice led by Health Canada<sup>60</sup>
- The Centre for Collaborative Health Education at Memorial University
- Seamless Care: Inter-Professional Education Project for Innovative Team-Based Transition Care at Dalhousie University and their affiliated academic hospitals/health authorities
- Education a la Collaboration Interprofessionnelle centre sur le Patient (Projet ECIP) at the Université de Montréal and L'Université de Sherbrooke
- McGill Educational Initiative on Inter-Professional Collaboration: Partnerships for Patient-Family Centred Practice in Quebec at McGill University
- Centre for Inter-Professional Education at the University of Toronto and the Toronto Rehabilitation Institute, University Health Network and the Toronto Academic Health Sciences Network
- Academic Health Council with the University of Ottawa, Algonquin College, La Cité Collégiales and the Champlain
- Local Health Integration Network
- Inter-Professional Education for Geriatric Care and the University of Manitoba
- Inter-Professional Network of British Columbia which includes health and education partners
- Inter-Professional Health Collaborative of Saskatchewan

As we see inter-professional team-based care emerging, we also witness major changes in the morbidity patterns in Canada. Such chronic diseases as diabetes and hypertension are becoming more common and more serious. Care to help manage these conditions may be provided in the hospital, but more likely this happens in the community or the home, and by a range of healthcare providers including nurse practitioners, community nurses, rehabilitation therapists and pharmacists. As the financial, personal and societal toll rises, all health care providers face the challenge of tackling these conditions more aggressively and actively, while focusing on health prevention and promotion.

**Table 5**  
**Select Affiliated Academic Healthcare Organizations by University**

UNIVERSITY	ACADEMIC HEALTHCARE ORGANIZATION
Memorial University	Eastern Health
Dalhousie University	Capital District Health Authority IWK Health Centre Horizon Health Network
Université de Montréal	Centre Hospitalier de L'Université de Montréal Hôpital Sainte-Justine Institut de cardiologie de Montréal Hôpital Maisonneuve-Rosemont Hôpital du Sacré-Cœur de Montréal Institut universitaire de gériatrie de Montréal Institut de Réadaptation de Montréal Hôpital Louis H. Lafontaine Centre Hospitalier Régional de Trois Rivières
McGill University	McGill University Health Centre Jewish General Hospital St. Mary's Hospital Douglas Hospital
Université de Laval	Centre Hospitalier de L'Université de Québec Hôpital Laval, Institut universitaire de cardiologie et de pneumologie
Université de Sherbrooke	Centre Hospitalier Universitaire de Sherbrooke Institut universitaire de gériatrie de Sherbrooke
University of Ottawa	The Ottawa Hospital Children's Hospital of Eastern Ontario The Royal Ottawa Health Care Group Bruyère Hôpital Montfort
Queen's University	Kingston General Hospital Hotel Dieu Hospital Providence Care
University of Toronto	University Health Network St. Michael's Hospital Hospital for Sick Children Sunnybrook Health Sciences Centre Mount Sinai Hospital Toronto Rehabilitation Institute Baycrest Centre for Addiction and Mental Health Bloorview Kids Women's College Hospital North York General Hospital
McMaster University	Hamilton Health Sciences St. Joseph's Health Care
University of Western Ontario	London Health Sciences Centre St. Joseph's Healthcare
Lakehead/Laurentian University Northern Ontario School of Medicine	Thunder Bay Regional Health Sciences Centre Sudbury Regional Hospital

Table 5 cont'd...	
UNIVERSITY	ACADEMIC HEALTHCARE ORGANIZATION
University of Manitoba	Winnipeg Regional Health Authority St. Boniface General Hospital Health Sciences Centre
University of Saskatchewan	Regina Qu'Appelle Health Region Saskatoon Health Region
University of Alberta	Alberta Health Services
University of Calgary	Alberta Health Services
University of British Columbia	Vancouver Coastal Health Authority Provincial Health Services Authority Fraser Health Region Vancouver Island Health Authority Providence Health Care

Health education is also undergoing rapid change. Recent expansion in MD class sizes have spurred the development of distributed models of education and the creation of satellite campuses. Clinical education opportunities have been developed in new settings and new communities. This no doubt also reflects the impact of new technologies that allow closer links between major hubs and remote communities. The same factor has allowed for the development of new mechanisms such as tele-care, tele-triage, and electronic health records that give rural and remote communities access to advanced specialty services at urban centres.

Currently, Canadian faculties of medicine have developed or are developing 12 regional campuses offering full MD education programs. Students are being recruited directly to some of these campuses. Because many are located in communities with mid-sized hospitals new to teaching, clinical faculty need to be recruited and their teaching skills developed.

The distributed campuses typically send students into surrounding communities. For example, the newest medical school in Canada, the Northern Ontario School of Medicine, uses a network of hospital and community sites across northern Ontario for the entire third-year clerkship. It is also part of the integrated clinical clerkship program at the University of Alberta and the University of Calgary, and is part of the health system in British Columbia in Prince George. The research activities at these sites are still usually underdeveloped, and will require nurturing and integration with activities at local universities or with the main campuses.

On the research front, governments and other health sector participants increasingly recognize the economic and social benefits of medical research. As well as increasing the rate at which discoveries enter the marketplace and spin-off companies are created, this is also challenging some institutions to re-think and re-align their approaches to commercialization of research findings.

All of these factors have changed the traditional model. The modern AHSC involves a larger constellation of health services organizations. Together, they constitute an emerging new model of academic health science activity: a group of academic healthcare organizations that collectively delivers the three traditional missions of care, education and research, but individually may only fully deliver on specific elements of the three missions. Other universities, community colleges and educational institutes, alone or in partnership with health sciences universities, may now be elements of the network, which is also characterized by new team-based approaches, new ways of making decisions, and new venues for teaching and research.

We acknowledge this expanded model but recognize that as traditional AHSCs now form part of a bigger system, there is a risk of losing sight of their historical role. More specifically, there is some international evidence that with regionalization, in which one board oversees several organizations that provide a range of health services across a broader continuum of care, the value of the specialized academic health care organization may not be fully realized.<sup>61 62</sup> In some cases, the evolution is seen as a threat. An August 2009 article about the Australian context states that "The traditional model of medical education and the sustainability of academic medicine are under strain."<sup>63</sup>

Conversely, many of the system changes affecting AHSCs can be viewed as opportunities. For example:

- Community or rural hospitals, nursing or long-term care facilities, home care providers, public health agencies, and primary care practices are now serving as important clinical education venues for students in the health professions;
- Certain patient care services that were traditionally provided only by teaching and research hospitals (for example, complex obstetrical care, advanced imaging, orthopaedics, cardiovascular care and ophthalmology) are increasingly available from community health care providers; and
- Research activities not reliant on specialized research facilities and resources housed mainly in universities, teaching/research hospitals or research institutes – such as applied health services research, population health research, and clinical trials – are increasingly undertaken in a number of community care provider settings.

In short, the number and kinds of entities that now deliver aspects of the AHSC mission have increased, creating a network with the potential for broader impact across society.<sup>64</sup>

We believe that Canada's health sciences universities and the academic healthcare organizations with which they have formal affiliation agreements will continue to constitute the critical nuclei of these emerging networks. However, we have also concluded that a more contemporary and inclusive definition is needed that builds on the traditional core mission and mandate of the AHSC and also accurately reflects the new relationships that are emerging among a variety of health services organizations working together on some or all of the components of the care-teaching-research mandate.

Based on the current range of these relationships and others that might emerge in the future, we have developed a definition that formalizes the shift from "centre" to "network": *An "Academic Health Sciences Network" or "AHSN" is a set of formal partnerships created by health sciences universities, academic healthcare organizations and other provider organizations with the goal of improving patient and population health outcomes through mechanisms and structures that develop, implement and advance integrated health services delivery, professional education, and research and innovation. At the core of this network is the AHSC, working closely with other academic healthcare organizations who focus, in whole or in part, on the care-teaching-research mandate.*"

Amplifying on this definition, we would view each AHSN as being anchored in a health sciences university with a faculty of medicine and long-standing formal relationships with the traditional academic healthcare organization partners – which are the AHSCs themselves - plus other new partner and collaborator health care provider organizations, and other universities and colleges who educate health care professionals. Using this definition, there are 17 AHSNs in Canada at present (as set out in Table 5), one centered on each of the country's university medical schools and at least one affiliated teaching/research hospital.

The concept of the AHSN is not new. As early as 1995, Ontario's Provincial Coordinating Committee on Community and Academic Health Science Relations (PCCCAR) adopted it as the preferred future vision.<sup>65</sup> In the PCCCAR vision, the principles for such networks are:

- An organization developed around working partnerships based on common goals with a shared sense of leadership rather than centralized hierarchy;
- Adoption of a needs-based approach rather than supply-side driven;
- Evidence-based decision-making where possible;
- Bi-directional informational exchange across organizations;
- A "we" relationship expressed by shared vision and mission; and
- The acceptance by current AHSC partners of new members of the network, working together to make the most effective use of available skills, knowledge and resources for patient care, education and research.

In the PCCCAR vision, the AHSC would continue to comprise the original partners (i.e., universities and their health professional faculties, teaching/research hospitals and their research institutes, and clinical and research faculty). It would be enriched, though, by the addition of new partners to form the AHSN. The new partners could include community hospitals, teaching health units, long-term care and rehabilitation institutions, community care provider organizations, colleges and other non-science universities that educate health professionals.

The PCCCAR expected that the benefits of this broad and inclusive approach to health service delivery, education and research would include:<sup>66</sup>



- Closer links between the AHSC and providers in new fields included in the AHSN, leading to better coordination of services, timely follow-up and enhanced support;
- A multi-disciplinary approach to education of health professionals better prepared to meet the needs of the communities in which they would ultimately work;
- Practical educational experiences in typical settings where most health professionals practice and greater exposure to a broad range of patients and conditions;
- Enhanced commitment to ongoing education and life-long learning;
- Capacity to enhance the collection, use and dissemination of information to support needs-based planning and evidence-based decision-making;
- Better health human resource planning through enhanced linkage of “producers” and “consumers” of health profession talents and skills;
- More effective links with industry to capitalize on the economic potential and wealth creation opportunities afforded by the commercialization of goods and products from health research;
- Linkage between networks to develop province-wide strategies and approaches to improving population health and wellness; and
- Active and visible support of the academic health sciences to benefit communities, institutions and providers.

The AHSN would now be expected to lead in the development, coordination, integration and dissemination of new knowledge and innovative and cost-effective leading practices across a broader continuum of care. As a result, the AHSN plays a crucial role in developing and accelerating the implementation of innovative and more cost-effective approaches to patient care and health delivery that have wider application.

These benefits are as necessary to the health care system today as they were more than a decade ago. While this report discusses key issues including definition, structure, synergies, resources and sustainability, the true measure of the value of AHSNs in the eyes of Canadians are the benefits that are provided to individuals and communities through improved care delivery, and to the nation as a whole through better health, the translation of leading-edge scientific discoveries into clinical practice and the increased prosperity that commercialization can create.

Although the National Task Force has identified the emergence of the AHSN in the Canadian context, and its expected principles and benefits, one of the critical practical questions that remain is: what constellation of organizations should form the membership of an AHSN?

The focus of our work was national, and as such we cannot pronounce on which organizations should be part of an AHSN at the provincial, territorial and/or local level. We note, however, that to guide these local discussions it will be important for each jurisdiction to develop appropriate criteria for membership. In this context, it is important to highlight recent developments across the country.

In Québec, four *Réseaux Universitaires Intégrés de Santé (RUIS)* were introduced in 2003 and are associated with their respective university (Université de Montréal, McGill University, Université de Laval, and Université de Sherbrooke) and affiliated academic hospitals. In Montreal, the Université de Montréal RUIS has a Management Committee that is comprised of the Chief Executive Officers of all university affiliated hospitals and institutes (i.e., Centre Hospitalier de Montréal, CHU Hôpital Sainte-Justine, Hôpital du Sacré Coeur de Montréal, Hôpital Masionneuve-Rosemont, Institut de cardiologie de Montréal, Institut universitaire de gériatrie de Montréal, ), the Chief Executive Officers of the Montreal health region, and the Dean of Medicine. Other permanent members include a Chief Executive Officer representing the other affiliated hospitals without official designation, the Chief Executive Officer from the other regional health agencies, the Deans from the Faculties of Nursing, Pharmacy and Dentistry, the Executive Vice-Dean of Medicine, and a representative from the Ministry of Health and Social Services.

The Executive Committee is comprised of the Chief Executive Officers of the major teaching hospitals, the Chief Executive Officer of the Montreal Health Region, a CEO-representative of the other health regions, a CEO of the other affiliated hospitals without official designation, the Dean of Medicine, the Executive Vice-Dean of Medicine, and a representative of the Ministry of Health and Social Services. The Executive Committee meets six times a year; the Director’s Group four times a year.

The objectives of La RUIS are: (1) to promote the coordination, complementarity and integration of the patient care, teaching and research missions of the health institutions designated as university institutions and the universities with which those institutions are affiliated; and (2) to improve access to health care by streamlining relationships between primary care providers (physicians and regional hospitals) and upper level care providers for specialized procedures. The number of standing committees and working groups varies with each RUIS.<sup>67</sup>

The *Toronto Academic Health Sciences Network* (TAHSN) was established in the early part of this decade building on the Toronto Academic Health Sciences Council which was created in the mid-1990s. TAHSN includes the University of Toronto and its affiliated academic hospitals – of which there are ten. Full Members participate in health and biomedical research and teach undergraduate and postgraduate medical and healthcare professional students. Associate members include North York General Hospital, St. Joseph's Health Centre and Toronto East General Hospital. Member organizations are represented by the Dean of Medicine and the President & CEO of the academic hospital. Other participants include the Council of Academic Hospitals of Ontario, MaRs Discovery District, and the Toronto Local Health Integration Network.<sup>68</sup>

The mission of TAHSN is to be a dynamic consortium of the University of Toronto and its affiliated academic hospitals to serve as a leader in Canadian health care by developing collaborative initiatives that optimize, advance and sustain a shared academic mission of high quality patient care delivery, education, knowledge transfer and innovative research. TAHSN engages in local, regional and provincial system planning to advance its collective academic mission. The work of TAHSN is supported by a number of standing sub-committees including: Research Committee; Medical Affairs Committee; Research Ethics Committee; Communications Directors Committee, and Chief Nursing Executives Committee; Pandemic Planning Committee; and Education Committee.<sup>69</sup>

The *Saskatchewan Academic Health Sciences Network* (SAHSN) was established in 2002. Membership consists of the three sectors involved in the academic health sciences – government, post-secondary institutions and regional health authorities. The Government of Saskatchewan is represented by two Deputy Ministers from the Ministries of Health, and Advanced Education, Employment and Labour. Post-secondary institutions are represented by the University of Saskatchewan, University of Regina and the Saskatchewan Institute of Applied Science and Technology. All regional health authorities are represented, however, Regina Qu'Appelle Health Region and the Saskatoon Health Region are represented by their President & CEO, and the other health authorities are represented by one President & CEO.<sup>70</sup>

The mission of SAHSN is to work to create an environment of excellence amongst its partners where the education of health professionals, health research and the provision of health services are complementary activities enhanced through interdependent relationships. The work of the Network is supported through three standing committees: Academic Health Sciences Centre Standing Committee; the Information Technology Committee; and the Advisory Committee on Clinical Education.<sup>71</sup>

The *British Columbia Academic Health Council* (BCAHC) was launched in 2002 – building on the BC Council of Teaching Hospitals – and is comprised of the Presidents and CEOs of the Health Regions, senior academic leaders from universities, colleges and institutes; the Assistant Deputy-Ministers from the Ministry of Health Services and the Ministry of Advanced Education and Labour Market Development, and the Chief Executive Officer of the Council.

The mission of the BCAHC is to serve as a major strategic forum for effective collaboration, partnership and leadership by senior leaders in health and education. BCAHC develops consensus on strategic objectives and implements a committee structure to achieve those objectives. The work of the Council is supported by an Operating Committee - which provides ongoing leadership, advice and guidance to accomplish the vision and priorities identified by the Council.

Of interest, the design, structure and mission of the four organizations is similar; and they all underscore the importance of the need for enhanced collaboration and coordination of activities. Some have a broader array of institutional members/regions and more diverse representation at the table; for example, TAHSN has associate members, and La RUIS, SAHSN and BCAHC have government representation. All have established sub-Committees to address those issues that require further consideration and discussion.

Based on the missions of each Network/Council, Table 6 outlines some of the ongoing issues and challenges that will likely require further discussion.

Given local, political, economic and historical events, it will be up to the AHSN community to determine how best to move forward to meet their needs and fulfill their stated mission. The recent emergence of Networks/Councils also suggests that it will be important to undertake some form of assessment or evaluation to determine their overall effectiveness, and areas for improvement.

**Table 6**  
**AHSN Issues and Challenges**

<p><b>Optimization of Models of Collaborative Practice</b></p> <ol style="list-style-type: none"> <li>1. What is the most effective way to coordinate the development of clinical sites for the training of students, and health care professionals on how to optimize this type of practice?</li> <li>2. How to assure the funding for the creation and maintaining of these clinical teaching units (e.g., physical site, non-physician professionals, evaluation)?</li> </ol>
<p><b>Optimization of Teaching</b></p> <ol style="list-style-type: none"> <li>1. What is the most effective way to develop and support the teaching milieu required to train the required number of health care professionals (i.e., various profiles and needs)?</li> <li>2. How to fairly adjust AHSN funding to take into account expanded teaching responsibilities (e.g., physical site, efficacy parameters, human resources, other costs)?</li> </ol>
<p><b>Optimization of Research</b></p> <ol style="list-style-type: none"> <li>1. What is the most effective way to develop a patient-oriented research approach throughout the AHSN – this includes support centres, networks and research at the primary care level?</li> <li>2. How to optimize knowledge transfer: (a) from bench to bedside; and (2) from bedside to practice to improve clinical outcomes and the efficient utilization of resources?</li> <li>3. How to effectively coordinate the funding of infrastructure (including the Canada Foundation for Innovation) and the indirect costs of research between the university, AHSC, health authority, and other (provincial and federal) funding agencies?</li> </ol>
<p><b>Optimization of Patient Care</b></p> <ol style="list-style-type: none"> <li>1. How to effectively develop and coordinate tertiary and quaternary care (and how will primary and secondary care be involved in certain instances)?</li> <li>2. How to optimize the use of best practices throughout the health region (e.g., hierarchal care, integrated care)?</li> </ol>

It is also essential to underscore the point that the creation of the AHSN is not intended to supplant or compete with the broader system role that the provincial/regional health authorities or local health integration networks fulfill. Rather, the work of the AHSN is concentrated on the strategic interplay and maximum leverage between patient care, education and research – which should involve a provincial/regional health authority or local health integration network.

While the focus and structure of the AHSN produces a number of value-added health care and health system benefits that extend beyond this community, the broader system organization, delivery, funding and management decisions clearly remain with the regional health authorities and local health integration networks working with their respective governments.

In this context, it becomes essential that the AHSN and provincial/regional health authorities and local health integration networks establish a clear understanding of each others’ roles and responsibilities and develop a strong working relationship to avoid any duplication of effort while taking full advantage of how patient care, education can be fully leveraged.

In addition to these developments in Canada,<sup>72</sup> the National Task Force thought it was important to highlight a recent process that was initiated in the United Kingdom in order to confer the designation of an “Academic Health Sciences Centre” to an organization.

To be designated, organizations must meet the following criteria:<sup>73</sup>

- Excellence in patient care
- Excellence in undergraduate and postgraduate medical education and (as appropriate) other areas of healthcare and health sciences education
- Excellence in biomedical clinical and applied health research that is of international standing across a range of interests and of critical mass
- Vision, ambition and partnership arrangements for delivering benefits in patient care, with an emphasis on benefits for the local community.

Successful applicants also “need to demonstrate a clear vision and strategy, underpinned by a strong partnership and robust governance arrangements, and show that they have the capability to translate new discoveries into practical actions and improvements for patients across the NHS and internationally.”<sup>74</sup> Sound financial management is a further prerequisite for designation.

Through this process, five organizations (Cambridge University Health Partners, Imperial College, King’s Health Partners, Manchester AHSC, UCL Partners) have received the designation, which is reviewed every five years.

We note that this process appears to focus on identifying the nuclei of what this report identifies as academic health sciences networks. For example, Cambridge University Health Partners is described as a partnership between the university and National Health Service organizations that work most closely with it in performing research and education and that involve academic doctors in the delivery of their services.<sup>75</sup>

As such, it is a good starting point for discussion in the Canadian context of both the nuclei and the full membership in networks. Along those lines, one of the responses from the survey conducted as part of the background seems to point to a fairly broad definition of the network: *“Although AHSCs generally provide tertiary and quaternary care, the provision of primary and secondary [and some tertiary] care services need a well managed network of hospitals within the system that includes AHSCs. ... There [also] needs to be clarity in defining the different patient care responsibilities of AHSCs as compared to community and regional centers within a well-managed network with excellent communication between the facilities.”*<sup>76</sup>

This comment opens the door to considering community hospitals and other organizations as AHSN members. Certainly, this may well make sense as the distributed education model discussed above is adopted more widely.

## 4. The AHSN Value Proposition

Having set out definitions for both the Academic Health Sciences Centre and the emerging Academic Health Sciences Network, we believe it is essential to articulate their value propositions.

Historically, the value to society of placing educators, students in such professions as medicine, nursing and pharmacy and researchers in hospitals, working with real patients, was clearly greater than having them work in isolation and denying hospitals the benefit of their skills and knowledge. This is exactly why the model of teaching/research hospital spread so quickly across North America in the twentieth century.

Since the model was introduced, its benefits have multiplied enormously. Because of their role at the leading edge of medical training and research, AHSC-affiliated hospitals are unique in their ability to deliver tertiary care: that is, to have available on a 24/7 basis the needed skills, equipment and other inputs to deal with severe and complex cases. For this reason, they are an invaluable resource for the family physicians who give primary care and the smaller hospitals that provide secondary care. And it is only the largest and most advanced academic healthcare organizations that can provide the next level – quaternary care – by marshalling the critical mass of diverse expertise and knowledge needed to tackle the rarest and most complex illnesses.<sup>77</sup>

What has increasingly differentiated the AHSC, then, is the highly sub-specialized care it provides, its use and development of new technologies (such as lithotripter, gamma knife, interventional radiology and advanced imaging, specialized pathology resources, and experimental procedures, drugs and devices), and the significant resources it puts to work. AHSCs are in many respects the primary “engines of health innovation”. This is reflected in the many advanced clinical services once available only in AHSCs that are now provided in other health care settings: a tribute to the AHSC’s capacity to make leading-edge technologies and skills routine, allowing them to be safely and effectively adopted in other venues. This underlines its important role in knowledge creation and translation.

### 4.1 AHSNs and their National Impact

For students, educators and researchers – working daily at such a high level, trying to heal the most critically ill patients or to understand the causes of their condition, and being able to draw on the insights of leading practitioners – the experience is invaluable. The pace is demanding and the stakes are high, but the atmosphere is alive with new ideas, discoveries and thoughts. Appendices B and C summarize some of the world-first discoveries and spin-off companies that have emerged from Canada’s academic healthcare organizations. This reflects the national and even international impact they can have.<sup>78</sup>

All of this underlines why the AHSC is the crucible from which so much medical progress has arisen: it is unique in bringing together so many skills, expertise and specialized research infrastructure in a real-world medical setting, and creating from that interaction a whole that is far greater than the sum of its parts. That is the historic “value proposition” of the AHSC: convergence of resources and synergy in their interaction.

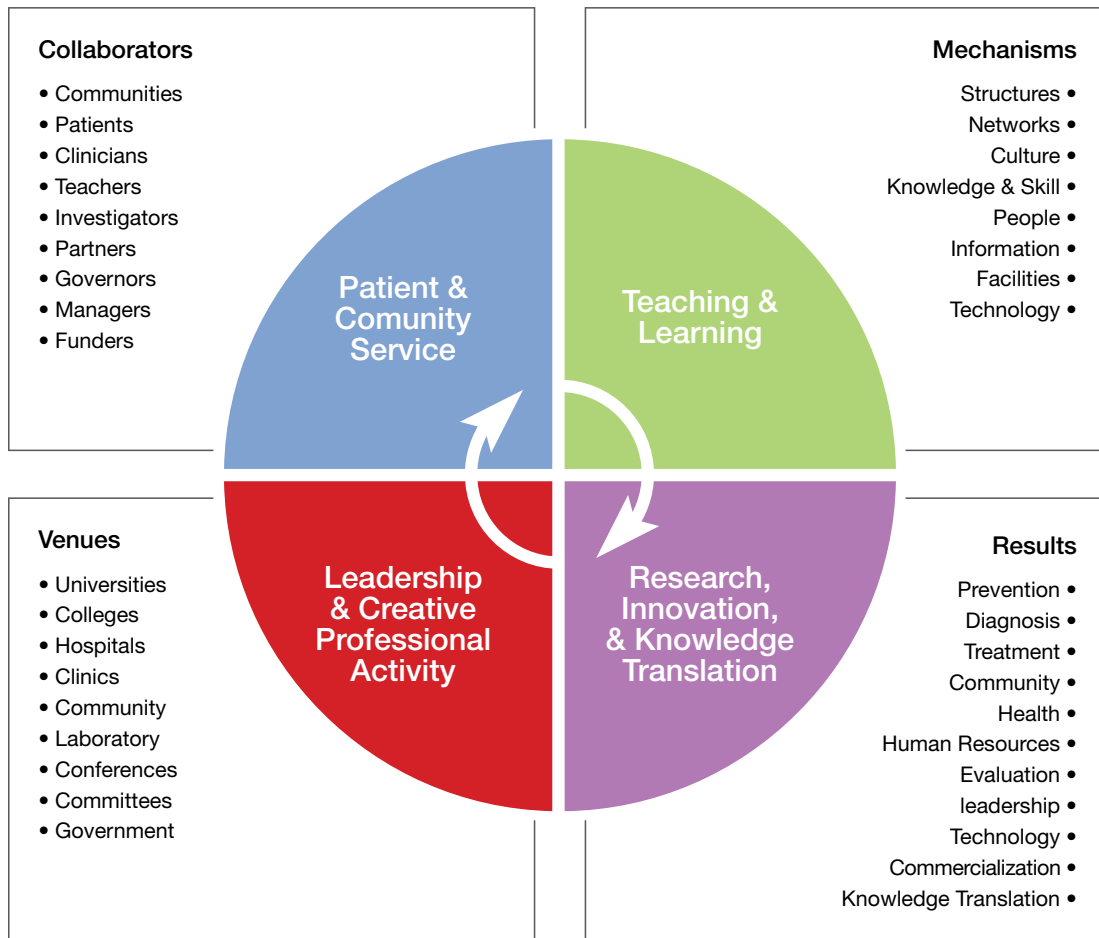
It also underscores the national scope and contribution of AHSCs in terms of: (1) science and discovery, with its needed infrastructure, have no geographical boundaries and while research needs to be adapted, it has application in Canada and the rest of the world; (2) clinicians trained in one province’s AHSC – which is the principal means of sustaining the supply of health care practitioners – may practice in another part of the country; (3) a number of complex low volume procedures provided by an AHSN can serve patients from a number of provinces and/or regions; (4) innovations in health care, health care delivery and teaching developed through the integration of patient care, education and research can be translated to other parts of the health system; and (5) the creation of spin-off companies that commercialize products and services contribute to the long-term economic prosperity of the country.

With the evolution to the AHSN – that is, to a broader network of organizations and expertise – it is important to consider the impact on that value proposition. The AHSN is a larger assembly, involving far more players and organizations, often working in a less hierarchical structure, and likely spread over a larger geographical area.

Figure 3 lays out many key components of the AHSN and how they interact with one another – it should not be taken as exhaustive. It shows the larger number of venues in which care, teaching and research take place. It also illustrates the wider array of partners who must collaborate effectively to create value. Supporting this goal are such mechanisms as structure, culture and technology that can support the enterprise – or stand in the way of it reaching its full potential.

That potential appears in the bottom-right quadrant: its outputs. Although many of these were possible within the more traditional AHSC model, we believe that the network approach potentially offers a much richer array of benefits for patients, populations, government and society as a whole. Furthermore, while the AHSN focuses on the synergies that come from its tri-partite mandate, we believe that the issue of leadership and creative professional activity is essential at all levels of the network, and is the foundation upon which future success can be achieved.

**Figure 3**  
**AHSN Components**



Consider, for example:

- With the development of regional campuses that are part of the evolving AHSNs, many undergraduate medical students now receive training – in some cases their complete training – in regional hospitals, community offices and remote communities. Moving from the traditional model, in which the AHSC is the main learning venue, represents a huge change. One of the benefits is that students more frequently learn by working with the “undifferentiated” patient – that is, the patient as first seen by the doctor, as opposed to the patient already admitted to a tertiary care hospital who has been diagnosed and is being treated.
- In a similar vein, students are now doing rotations in settings that were not part of the traditional AHSC – for example, in palliative care hospices or wards, in long-term care facilities, and in primary care offices in the community. These venues help to create better-rounded physicians by placing them from the start in the full range of situations in which they are likely in practice to see patients and, often, their families.
- The AHSN concept is also demonstrated by inter-organizational approaches to patient care. For example, a collaboration between the University Health Network and the Toronto Rehabilitation Institute, Canada’s largest academic hospital specializing in adult rehabilitation and complex continuing care, has helped to significantly reduce

the time a patient spends in acute care. A staff person with clinical background uses a combination of tools, skills and knowledge to facilitate the transfer of patients who are ready for either rehabilitation or complex continuing care. This approach has worked with several types of patients, including those with musculoskeletal problems, stroke, and acquired brain injuries. Depending on the group, alternate level of care days (or days spent waiting in acute care) decreased by between 9 and 20 days. The results included both significant cost savings to the system and a better experience for the patient.<sup>79</sup>

- Collaborations between health sciences centres and universities are also influencing patient care. For example, the Regina Qu'Appelle Health Region's Bariatric surgical assessment clinic (BSAC) – a collaboration with the Allied Health Centre at the University of Regina – is a multi-disciplinary approach to achieve better outcomes from bariatric surgery for patients with severe weight problems. The clinic's team includes a dietician, psychologist, nurse, exercise therapist and physiotherapist. The patient meets with each discipline regularly, and the team discusses and shares information on a weekly basis. The goals are to increase the likelihood of success for the patient; allow surgeons to better focus their time and effort, and help them better assess patient eligibility for surgical intervention; and provide post-discharge care to patients at regular intervals.<sup>80</sup>
- For researchers, the increasingly complex nature of biomedical and health services research is driving the formation of teams involving an ever-wider range of disciplines and sub-disciplines and across a number of settings. Canada's Cancer Stem Cell Consortium recently received \$40 million to co-lead two international stem cell research projects with the California Institute for Regenerative Medicine to turn cancer stem cell research into improved treatments for patients. Clinician-scientists within the AHSN continue to play a crucial role in advancing research in this area.<sup>81</sup>
- Multiple AHSNs can be involved in research. For example, the Canadian Longitudinal Study on Aging (CLSA) involves over 160 researchers from across Canada. It is a national study that will follow approximately 50,000 Canadian men and women between the ages of 45 and 85 for at least 20 years. The study will collect information on the changing biological, medical, psychological, social, and economic aspects of people's lives in order to understand their impact on health, disease and disability in aging. The Canadian Institutes of Health Research (CIHR) describes the CLSA as "one of the most comprehensive studies of its kind undertaken to date, not only in Canada but around the world". AHSNs will play an important role through the research generated from their clinician-scientists and the involvement of patients across the spectrum of care.<sup>82</sup>
- Finally, new models of care and best practices can spread from one AHSN to multiple settings, for example, a protocol was developed by the Ottawa Model Smoking Cessation Network whereby every patient upon hospital admission is screened for smoking and offered smoking cessation medications. A nurse will follow up with the patients after hospital admission with the aid of interactive voice recognition systems. Where a risk issue is identified, the IVR records the response and the nurse follows up with the patient individually. Efficiency of the protocol allows one nurse to handle up to 1000 patient cases per year. The model has been studied and evaluated and results in 50% of patients being smoke free within six months. The model is so successful that it has spread across Ontario through funding from the Smoke Free Ontario and the Ministry of Health Promotion. Health Canada has now funded 10 pilot sites across Canada.

These examples show how the AHSN, working across several domains, can considerably enhance the already valuable benefits of the care-teaching-research model to the health of Canadians. As with the AHSC, the unique value of the AHSN arises from its ability to simultaneously think, study, research, discover, evaluate, innovate, teach, learn, improve and care.<sup>83</sup> With its wider network of venues and expertise, however, it offers even more opportunities to create benefits from synergy and convergence. These often reach beyond the disease treatment paradigm, to focus for example on prevention and health promotion, and can be delivered by other organizations or practitioners. To further illustrate this point, Table 6 provides a summary of several condition-specific examples that underscore the role that AHSCs play in accelerating research-to-practice.



**Table 7**  
**AHSCs as a Platform for Accelerating Research-to-Practice**

A clinician scientist is an individual who has joint responsibility for research and patient care. They are also most often clinical trainers and mentors.<sup>84</sup> In 2009, a number of clinician-scientists were recognized by the Canadian Institutes of Health Research, the Canadian Health Services Research Foundation, Les Prix Galien, and the Canadian Medical Association for outstanding achievements in the application of research in clinical practice. These accomplishments tell the story not only of extraordinarily talented individuals, but also of the settings, that provided the actual and metaphorical laboratories in which brilliant minds identified and solve real problems. In these five vignettes, the role of the AHSC is shown as a source of relevant problem identification, system change, access to patients, and multidisciplinary teams.

**Heart Attacks** – The senior cardiologist at the University Hospital in Edmonton, Dr. Paul Armstrong, observed that French doctors rode in ambulances to start the Cardiac care treatment for patients with heart attacks before arrival at the hospital. While this was not felt to be feasible here, in 2000, Dr. Armstrong began an experiment to train paramedics to do an ECG of the heart. The paramedics would use a cell phone to report the results to the cardiologist at the hospital’s Emergency Department who could confirm the diagnosis at which point either a drug could be administered or the ED could prepare for the patient’s arrival. The protocol has improved access across Edmonton, saved lives, reduced the long term impact of heart attacks and prevented the serious social and economic consequences. In this case, the AHSC provided the empirical setting and support for the initiative. Dr. Paul Armstrong received a CIHR-CMA award for this initiative.<sup>85</sup>

**Pain Management** – Best Practice Guidelines are a synthesis of the evidence about a clinical problem. As such, they are invaluable in the sense that they assess volumes of research evidence that may not otherwise not be easily accessible in a busy practice setting. However, in order for these guidelines to make a difference in care, they require adaptation, resources, leadership and attention to context, and individual factors. Dr. Judith Ritchie helped to furnish these critical success factors for the implementation of guidelines such as those for pain, falls and pressure ulcers at the McGill University Health Centre. Examples of the impact of leading the implementation of these guidelines included a 50% reduction in severe falls, a 35% reduction in falls, and 40% reduction in pressure ulcers. The social, ethical, medical and financial consequences of improving these conditions contributed to Dr. Ritchie’s receipt of the Evidence through Excellence Award in 2010.<sup>86</sup>

**Hip and Knee Replacements** – The Greater Toronto Area has a population of well over 5 million people and some 25 organizations that provide care for joint replacement patients. Recognizing an important efficiency problem combined with growing demand as identified in multiple system-wide reports, Dr. Nizar Mahomed, an Orthopaedic Surgeon and Researcher at the University Health Network, led 25 organizations in a system-wide change that involved senior administrators, researchers, and clinicians in implementing a system-wide change in how joint replacement patients received rehabilitation. At the onset of the project, joint replacement patients were being discharged to inpatient rehabilitation beds for follow-up care. Using both research evidence and structured change management practices, the discharge destination for thousands of patients was moved from hospital to home. CIHR and the Canadian Medical Association noted “Patient health outcomes improved, their hospital stays were shorter, hospitals were able to do more surgeries, and taxpayers saved millions” and awarded Dr. Mahomed a CIHR-CMA knowledge translation award. The initiative was spurred through a small team of researchers and clinicians from the University Health Network, Toronto Rehab, and the University of Toronto that provided a baseline model and facilitated the leadership and change management that was required.<sup>87</sup>

**HIV/AIDS** – In his post doctoral studies at the St. Paul’s Hospital in Vancouver in 1981, Dr. Julio Montaner observed that many young people coming to the clinic were presenting with a rare form of pneumonia. It was soon learned that these patients were suffering of AIDS. Using inspiration from his father’s treatment of Tuberculosis patients in Argentina, Dr. Montaner attempted antiretroviral therapy to attack the AIDS virus directly. In 2006, he and colleagues published groundbreaking data showing that the antiretroviral cocktail of drugs helped those infected and slowed the spread of the virus. He is also a recipient of a CIHR-CMA award and Director of the British Columbia Centre for Excellence in HIV/AIDS (BC-CfE) and President of the International HIV/AIDS Society.<sup>88</sup>

**Epilepsy and Alzheimers** – Dr. Donald Weaver is a neurologist with a PhD in computational science. He is the Director of Medical Research at Dalhousie and has appointments at the Capital Health District Health Authority and at the IWK Health Centre. Dr. Weaver won the highest international distinction for biopharmaceutical research world-wide for his work on novel drug therapies that help to treat chronic neurological diseases like Alzheimer’s and epilepsy. His colleagues acknowledge him as a person who combines ‘multidisciplinary team work in most successful collaborative manner and as a role model of clinician scientists’.<sup>89</sup>



The network approach also offers not just more research partnerships, but the potential to apply the findings of research to work faster and more effectively. We looked earlier at the new definition of the AHSC in the United Kingdom: one that reflects partnership between a university and its closest partners in health care delivery. This comment on the UK approach speaks to the central role of such partnerships in sharpening the focus on research-led healthcare and transferring that knowledge to the local community: *“If the new organizational structures being established by the AHSCs can successfully facilitate collaboration and provide a greater focus for research-led healthcare, then the impact of AHSCs for delivering benefits in patient care, with an emphasis on benefits for the local community should be considerable.”*<sup>90</sup>

All of this underlines the crucial roles that the AHSN can play in such areas as:

- Driving new models of patient care, safety and quality improvement;
- Translating knowledge and promoting evidence-based care and best practices;
- Making curriculum development more relevant for future health professionals and those already in practice;
- Exploring new models for safe, effective and affordable care delivery; and
- Helping to achieve identified research and innovation priorities.

## 4.2 Measuring AHSN Performance

To strengthen these roles and the AHSN value proposition, we believe it is important to develop a series of metrics that capture the range of outcomes produced by the Network. While it remains an open question whether such metrics should be based on local or provincial and/or national objectives, consideration should be given to whether they should be framed over specific periods of time (e.g., short-term, medium-term, and long-term).

Recognizing: (1) the substantive complexity of developing meaningful, complete and parsimonious metrics and performance indicators; (2) the need for indicators that provide both standardization and flexibility in order to be tailored to the needs and goals of each individual AHSN; and (3) the scope of this report, the following are provided as possible examples - where some metrics are already in existence, and others that need to be considered:

- Identification of the academic mission as a strategic direction, goal or explicit part of the mission or vision of the organization, and evidence of its translation in operating and strategic planning, and budgets;<sup>91</sup>
- Clinical outcomes of a range of standard complex diseases and their interventions (for example, cardiac valve surgery, etc.), including morbidity, mortality, wait times and patient satisfaction;
- Critical mass for complex, rare and expensive procedures, inter-organizational relationships for referrals, and a role in regional, provincial/territorial or national service delivery for such conditions.<sup>92</sup> Evidence outreach to community hospitals and settings for both the diffusion of innovation and continuity of care or integration across the continuum;
- Accreditation by various educational bodies and colleges recognizing appropriate and sufficient infrastructure for clinical training purposes (i.e., accreditation awards and status using rigorous criteria and standards-based programs for undergraduate health professional education [e.g., Canadian Accreditation of Canadian Medical Schools, Canadian Association of Schools of Nursing]; postgraduate health professional educational programs providing basic post-basic or specialty education for health professionals [e.g., Royal College of Physicians and Surgeons of Canada, Canadian Society of Hospital Pharmacists] and for continuing health professional education offices/programs [e.g., Canadian Accreditation of Continuing Medical Education]);
- Demonstration of organization-level support for research-to-practice and the adoption of innovation activities. For example, the identification of champions and staff to assist with the synthesis and use of evidence, or the adoption of guidelines or best practices for use in practice, change management structures that support new models of care or decision-making resulting from evidence and innovation, cultural considerations, leadership requirements and other resource considerations;<sup>93</sup>
- Any or all of the indicators included in the draft of the Canadian Institutes of Health Research Patient-Oriented Research Strategy for the renewal of funding (i.e., the integration of researcher patient care units; the number of studies conducted, completed and published; the number and increase of patients recruited into patient-oriented research, the success at and increase in training, recruiting and supporting health professionals; the adoption of best practices and demonstration of outcome improvements);<sup>94</sup>

- Evidence of a research agenda that is set deliberately and in conjunction with clinicians, researchers, administrators and governments with a view to structuring research in a manner that results in its application;
- A set of proxies for the adaptation and utilization of research in practice with current and incoming clinicians (i.e., the development, adaptation, and use of clinical pathways and best practice guidelines, clinical trials);
- The extent to which capacity is demonstrated for research, and research to practice, such as knowledge translation initiatives, project management, critical mass of experts, data repositories, and strategic plans;
- Case write-ups/reports that serve as demonstrations or pilot projects in which the integration from research to patient care outcomes is described and evidenced (i.e., one AHSN might, in collaboration with the provincial/regional health authority or local health integration network, choose to develop, adapt, implement a guideline or a new model of care for a specific condition such as diabetes, stroke, cancer, pain management);
- The extent to which current patient care, organizational and system issues, emerging evidence, and new models of practice are introduced to clinicians, and evaluated for impact; and
- Various volume metrics for patient care, research and training processes that are already commonly collected (i.e., number of publications, number of students trained, number of patents, number of commercialized products and services, etc.).

The performance metrics that we have listed so far, focus on demonstrating the benefits of each of the mandates of patient care, research and training, as well as the benefits of better integrating these mandates. However, since a key part of the National Task Force’s proposal is to broaden this focus to an expanded Network, performance metrics for the ‘network’ itself may also need to be established. This reflects that the objective of forming the Network is to achieve objectives that are better accomplished through multiple organizations’ contributions than through the performance of a single organization. While the development of such metrics is beyond the scope of this paper, it may be an important area to explore as the recommendations and implementation are further considered.<sup>95</sup>

Clearly, more discussion is required at the local, and possibly national level, to develop these and other indicators. Their importance, however, is that these metrics will serve to more effectively measure, manage and monitor the AHSN enterprise, and drive the optimization of their performance.

Finally, given the emergence of the AHSN, and its complex roles and responsibilities in Canada’s health system, we believe that these networks should continue to develop more effective ways in which to consistently communicate and promote their value proposition. Specifically, this would include the development of a marketing and communications programs designed to brand AHSNs with a number of target audiences – including the public, media, governments, healthcare organizations, the charitable sector, and the private sector. At the same time, these branding initiatives should be closely coordinated with efforts at the local, regional, provincial and territorial, and national levels.

With the evolution to the network model in Canada, the need to ensure that AHSNs are able to fully and effectively deliver on their value proposition is increasingly important. The balance of this report focuses on ways of achieving that.

## 5. A Vision for the Future

Canada's emerging AHSNs have their roots in a long and fruitful collaboration among clinicians, educators, researchers and the organizations in which they work. They bring unique value to our society, a value that has the potential to grow as they evolve further.

Securing the best possible future for AHSNs – and consequently, delivering their full value to the people they serve – will, however, call for careful focus. Today's AHSCs grew organically from the two-way synergies between health profession schools and teaching hospitals. Tomorrow's AHSNs, with their larger number of components, wider geographical range and new approaches to practice, present very different needs, pressures and opportunities.

Looking forward, we therefore saw a clear need to define the future vision for Canada's AHSNs. This vision should build on the existing leadership role in academic networking of today's AHSCs, ensure that they achieve the same or a greater degree of international recognition, and like them are able to attract and keep the world's best health researchers and practitioners.

In shaping our vision for AHSNs, we drew not just on our own research, findings and experiences, but on several studies completed in Canada over the past decade. These included the Romanow and Kirby commissions nationally, the Fyke Commission from Saskatchewan, the Provincial Health Services Review in Nova Scotia and integrated health plans defined by Regions in Quebec and LHINs in Ontario.<sup>96</sup>

The following set of expectations for our health and health care systems in the next ten years helped to inform the vision:

- The health of Canadians will be improved with a measureable reduction in premature mortality and preventable morbidity;
- Canadians will live longer and with more disability-free days;
- Access to care will be enhanced by collaborative models of care provided by adequate numbers of well-educated, compassionate health professionals working together synergistically;
- Canadians will enjoy access to a health care system acknowledged internationally as one of the best in the world;
- The goal of keeping Canadians living in their own homes for as long as possible will drive new models of care and support;
- Emphasis on promoting wellness, preventing illness and enabling self-care will be core elements of Canada's health care systems;
- Systems, structures and models for health care and service delivery will continue to evolve differently between provinces and territories in ways that best meet the needs of their citizens and communities;
- Evidence, research, knowledge translation and innovation will inform change throughout Canada's health systems and will create opportunities for economic development and growth;
- Economic realities will continue to drive the need for innovation, re-alignment and re-deployment of resources to support policy directions and facilitate system sustainability; and
- Canadians will continue to make important contributions to improving global health through research contributions and by lending expertise internationally.

The vision statement endorsed by the National Task Force is: *"Academic Health Sciences Networks (AHSNs) will improve the health of Canadians and enable Canada to be a global leader in health care, education and research."*

In our view, achieving this vision requires the full integration of research and education with patient care, so that research is connected and relevant and knowledge is translated into action to improve the health and health care of Canadians. AHSNs are central to this by:

- Generating new models of care and services delivery, and accelerating the translation of evidence, knowledge and best practice into clinical environments;
- Fostering new inter-professional practice and collaborative care models for educating future health professionals;

- Pursuing a wide spectrum of health sciences research and innovation including the assessment of new technologies and therapies, and being alert to the potential for commercialization and wealth creation;
- Maintaining capacity to address emerging national issues related to the health of the nation and enhancing the security of Canadians through mechanisms such as pandemic planning and emergency preparedness;
- Creating forums for local, provincial and territorial, national and international participation in health system transformation processes; and
- Promoting wellness, preventing illness and enabling self-care.

We have also concluded, however, that if AHSNs are to achieve the vision set out above and provide full value to Canadians, they must be appropriately structured, mandated, governed, resourced and enabled as they make the transition from the AHSC model.

With the desired end state set out, and awareness of the elements needed to support it, we then developed a series of concrete recommendations.

## 6. From Vision to Reality – Optimizing the Performance of AHSNs

We have looked at the historic and continuing value that close ties between Canada’s health profession schools and its teaching/research hospitals have created, and at the ways in which academic health sciences networks are bringing together more organizations and professionals with the potential to generate even greater health, social and economic benefits. We turn next to how to fully realize that emerging value and successfully build on the traditional model while widening and deepening the components involved. The goal is evolution to a model that will help us meet the health care challenges of today and the future, and optimize the performance of AHSNs.

We strongly believe that the recommendations set out in this chapter are key to transforming the structure of the AHSN and placing it on a path of superior performance and long-term sustainability. We begin with an internal focus – a look at how the AHSN should be structured, as well as how the AHSN community can support the model and help it reach its full potential. The remaining recommendations look outward, and speak to the crucial issue of the relationships between the AHSN and governments at the provincial/territorial and federal level.

### 6.1 Advancing the AHSN Concept

People from across the health and advanced education systems recognize that to truly capitalize on the promise and energy of today’s AHSC – especially in response to changes in how, where, when and why health care, education and research are provided – we must advance and nurture the concept of the AHSN.

At present, Canada has 17 emerging networks, each centred on one of its medical schools plus at least one affiliated teaching/research hospital. These tend to operate on a cooperative model grounded in goodwill. Achieving full value, however, calls for a willingness to adopt new approaches and, possibly, to change long-standing attitudes. The following quote from the case study component of our work sums this up: “Our challenge is getting beyond organizational egos and this inherent need to protect individual interests. Only when we start to think and act as a single entity will the AHSC Network in our community be truly successful...”.

The AHSN is a broader expression of the Academic Health Sciences Centre, and extends the application of the tripartite mission across multiple professions, disciplines, universities, faculties, and colleges, and health care institutions and organizations. It also broadens the concept from one that largely centres on acute care - with a focus on tertiary and quaternary services to one that includes the continuum of health and health care.

While the AHSN structure exists in different forms across the country, its focus allows for improved alignment with those sectors that are not typically focused on an academic mandate. This can lead to a more continuous care cycle for patients and populations; a richer training experience for clinicians, and the development and adaptation of leading practices in settings for which there has been less of an emphasis.

As set out in Chapter 3, fully embracing the network model will require health care organizations to recognize and accept a more collective responsibility for leadership in delivering on the care-teaching-research model. Organizations within the network will have to think in terms of the AHSN as a whole in order to make the best possible use of the value that each partner can bring to it. This may call for changes and enhancements to existing structures. It may also, in some cases, require a change in organizational cultures.

AHSNs are not alone in this: *“The fundamental challenge of leadership development (is) to get leaders to think, feel, and act as members of the same team.”*<sup>97</sup>

This is consistent with the Institute of Medicine findings from 2003 that show that Academic Centres have a fundamental role to play in driving sustainable system change through a more integrated model. The institute noted that: *“In taking on the [future] challenges, [AHSCs] will need to recognize the interdependent and complementary nature of their traditionally independent roles within an overall context that encompasses a commitment to improving the health of patients and populations.”*<sup>98</sup>

While the current, loosely defined networks have proven effective in discussing cross-cutting issues that require consensus for resolution, they are still relatively informal mechanisms. All major strategic policy decisions need to be ratified by each organization’s individual board.

At the same time, the governance of healthcare organizations has changed, with an impact on one key relationship. Traditionally, the governance structure of an academic health care organization – typically, a teaching and/or research hospital – included a representative of the affiliated university, appointed ex officio. This was designed to solidify the partnership between the hospital and the university and better align the missions of patient care, teaching and research.

In eight of the ten Canadian provinces, academic healthcare organizations are no longer governed independently. Governance has moved instead to provincial or regional health authorities, and these do not typically include ex officio university representatives on their boards.<sup>99</sup> Because an important structure that helped to align the AHSN organizations no longer exists, the influence of the academic partner on the healthcare organization is perceived to have weakened.

Given these realities, we reached a strong consensus that universities and healthcare organizations in the AHSN need a complementary model to help align and integrate their planning and priority-setting, policy development and execution of their strategies.

*“Unless we are more creative and tenacious in transcending university and hospital organizational structures, we run the risk of jeopardizing our collective future.”<sup>100</sup>*

As previously identified, one model that is emerging in several provinces is the creation of formal networks and related structures. Provincial models such as the British Columbia Academic Health Council (BCAHC) and the Saskatchewan Academic Health Sciences Network (SAHSN) have been created to provide forums for discussion of common policy issues, challenges and opportunities. In addition, there are examples of geographically focused networks in some provinces, including the Toronto Academic Health Sciences Network (TAHSN), and the four Réseaux Universitaires Intégrés de Santé (RUIS) in Quebec.<sup>101</sup>

Building on these examples, we believe that provincial and territorial governments should endorse and support the concept of the AHSN and the creation of entities that strengthen the alignment of all organizations within it.

## **Recommendation 1**

*“The National Task Force recommends that all Academic Health Sciences Networks (AHSNs) establish formal inter-organizational structures and governance mechanisms to support the development of integrated strategies, plans and policies, and ensure more effective planning, information-sharing, coordinated decision-making and policy implementation.”*

## **6.2 Maximizing the Synergy of The AHSN**

In our view, good processes are needed to drive good outcomes. The shift to a new model of leadership based in collaboration can only take place if it is backed with formal mechanisms that recognize the single-entity nature of the AHSN and support integration and planning across it. Such mechanisms will also make clear the individual roles and responsibilities of all partners.

AHSNs must be able to drive the single entity concept in such new ways as integrated planning, shared infrastructure, and some pooling of resources. This will require innovation in organizational design, and creation and testing of new models for inter-organizational planning, priority setting, resource allocation and decision-making. We recognize that not every attempt will work, but each attempt will ultimately get us closer to our vision. In so doing, it will be essential for the AHSN to develop an effective and ongoing working relationship with regional and community governance structures to ensure there is maximum complementary and minimum overlap in their roles.

We recognize, as well, that such approaches may require individual AHSN participants to relinquish some of their autonomy and the exclusive right to plan strategy, set priorities and allocate resources in complete isolation from one other. Even before the emergence of the AHSN model, such isolated approaches risked duplicating effort and losing strategic focus. Evolving to the network model provides a strong impetus to match professional collaboration – the hallmark of the traditional model – with organizational and strategic collaboration. We believe that the potential gains, especially for innovative solutions to some of our health systems’ most serious challenges, are enormous.

In line with the need for evidence-based decisions, we also support the use of appropriate metrics, benchmarks and other performance measures in integrated plans and are outlined in Chapter 4. This is part of AHSN accountability not just for the stewardship of their individual organizations, but for working together to deliver effectively on the care-teaching-research mandate.

As the Commonwealth Fund noted: *“If they were to have credibility, academic medical centres needed to have their houses in order, in terms of transparency in the way funds were handled and to be able to give a proper account of the value of their work to individuals, the population and the economy.”*<sup>102</sup>

## Recommendation 2

*“The National Task Force recommends that each of Canada’s AHSNs commit to developing integrated plans and strategies that will:*

- a. Guide its overall process of transforming to the network model;*
- b. Achieve the vision of the AHSN set out in this report (which is “to improve the health of Canadians and enable Canada to be a global leader in health care, education and research”) by:*
  - leading the development of innovative and value-added health care services, education and research, evaluation and knowledge translation,*
  - accelerating the dissemination of research-based evidence into clinical practice to implement leading practices to enhance the quality, accessibility and affordability of health care services and improve patient and population health outcomes, and*
  - integrating innovative collaborative models of education with health care delivery and research; and*
- c. Identify appropriate performance measures to assist in monitoring their progress and performance.”*

The AHSN model is relatively new, and is evolving in an environment that is itself changing rapidly. For these reasons, it would be valuable to leverage existing national mechanisms to allow AHSNs to meet on a regular basis to exchange information, lessons learned, and best practices; review the structural design of AHSNs and their strategic objectives; and consider the breadth of metrics to follow their progress and express their impact.

*“Professional organizations representing [AHSCs] and their constituent groups and professionals...should encourage and participate in the development of methods to enable [AHSCs] to measure the quality, quantity, and efficiency of mission-related activities and to benchmark their performance of mission-related activities against peer institutions.”*<sup>103</sup>

Such national groups as the Association of Canadian Academic Healthcare Organizations (ACAHO), the Association of Faculties of Medicine of Canada (AFMC), the Academy of Canadian Executive Nurses (ACEN), and the Association of Universities and Colleges of Canada (AUCC) have national tables to discuss key issues common to their members, as well as collaborating across organizations on joint discussions. These and other national organizations should consider providing forums for AHSNs, and should also consider including governments as full participants in the process.

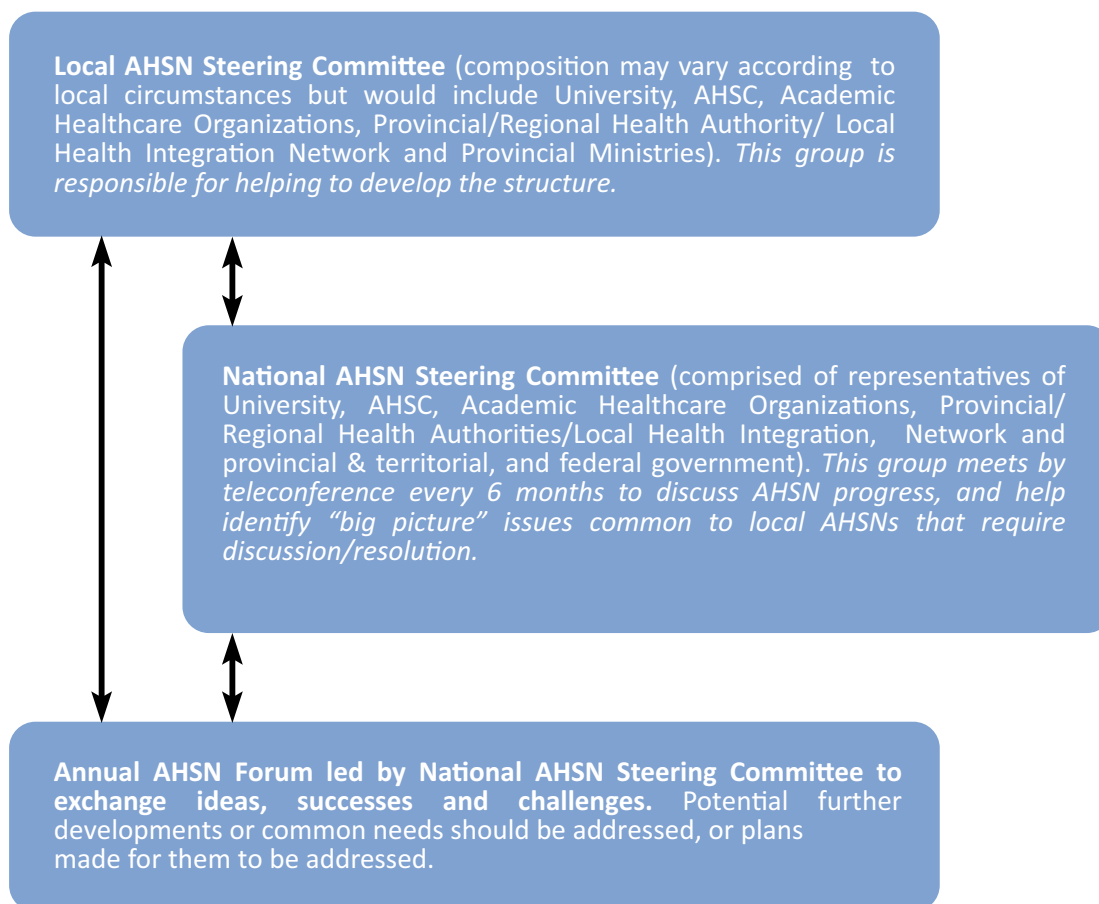
## Recommendation 3

*“The National Task Force recommends that the relevant national associations establish the appropriate structures, processes and forums for Canada’s AHSNs to meet on a regular basis. The objectives of these meetings would be: (1) to strengthen AHSN relationships; (2) to identify gaps or duplication in their mandates, plans, policies and/or programs; and (3) to share lessons learned and leading practices.”*



Figure 4 depicts how local AHSNs and a national AHSN process could work with one another. In this model, a National AHSN Steering Committee – comprised of those institutions and organizations that are part of local AHSNs – would be a link to all AHSN Steering Committees across the country and meet twice a year to identify and discuss those issues and challenges that should be framed within a national context. These issues would then be brought to the national AHSN Forum – which would meet on an annual basis.

**Figure 4**  
**Local & National AHSN Relationships**



### 6.3 Aligning the AHSN Structure With Provincial & Territorial Governments

As set out in the Constitution of Canada, responsibility for the delivery of health services and post-secondary education rests with the provincial and territorial governments. The provinces and territories thus play a leadership role in the priority-setting processes with AHSNs. The federal government helps to fund provincial and territorial health and education programs through transfer payments, and has a direct funding role for other activities, as discussed in the following section.

Each provincial and territorial government has its own model for organizing various constitutional mandates and responsibilities, with those related to the tripartite missions of AHSNs often divided across multiple ministries as described below and in Appendix D:

- Health care and related services are generally administered, regulated and funded through one or more ministries or departments of government (e.g. Ministry of Health, Ministry of Community and Social Services, Ministry of Children and Family Services, and Ministry of Health Promotion and Protection);
- Advanced education is most commonly organized through a single Ministry of Education (or Advanced Education and Training) with occasional oversight of some high profile programs for human resource-related planning vested in the Premier’s Office or other ministries or provincial agencies; and



- Responsibility for research and innovation programs are perhaps the least consistently defined within government structures, but are most often aligned with a ministerial portfolio that has responsibility for economic development.

Regardless of the government structure or organizational model, responsibility across multiple government departments or ministries has led to perceived challenges with the potential to limit the ability of AHSNs to successfully achieve their missions and fully benefit the communities they serve.

Descriptions from AHSN leaders captured during the research stage of the National Task Force’s work regarding the impact of responsibility across government departments included “mixed messages”, “multiple bosses”, “competing agendas”, “conflicting policies”, and “fragmented priorities”.<sup>104</sup>

Because governance and accountability models are changing, it is becoming even more important to ensure close coordination with and among all present and future ministry partners – including ministries of health and other ministries, particularly those responsible for education, and for research and innovation.

We therefore propose that AHSNs and relevant ministries work together on mechanisms to improve communications and better coordinate their collective efforts. Recognizing the complexity of doing so, bringing everyone to one table would provide significant benefit by making it easier to discuss policy issues that cut across government portfolios, leading to better decision-making. It would also improve the alignment of activities across AHSNs, allow for a more complete discussion of their accountability and deliverables, and examine ways of fully leveraging resources invested in them. The results would include less duplication of effort, improved policy coverage of key issues, better integration of policies, and greater return on investments in our health care system.<sup>105</sup>

#### Recommendation 4

*“The National Task Force recommends that AHSNs work with their respective provincial and territorial governments to create mechanisms through which AHSNs and all relevant ministries can more effectively communicate, share information and make decisions, and develop, coordinate and implement policies.”*

## 6.4 Working with the Federal, Provincial & Territorial Governments

We have expressed our strong view that the impact of each of Canada’s AHSNs is national – and in some cases international – in scope. In practice, this means:

- Given the unique range of tertiary and quaternary services they provide, AHSNs are inter-regional and/or inter-provincial referral centres;
- Providers who are trained in an AHSN in one part of the country often will spend part of their career practicing in another part of the country;
- Practitioners working in AHSNs are nationally certified, and Canadians who meet the requirements for provincial licensure (usually possession of a national certification) have a guaranteed right under the Charter of Rights and Freedoms of mobility to practice anywhere in the country;
- The impact of health research, innovation and commercialization can be global in terms of discovering and disseminating leading-edge knowledge and best practices; and
- Increasingly, research projects are themselves conducted by international networks of investigators who collaborate across geopolitical boundaries or borders.

The National Task Force endorses the view of the Senate Standing Committee on Social Affairs, Science and Technology: *“...the Committee strongly believes that, since they (AHSCs) play an essential role in teaching, performing research and delivering sophisticated care, AHSCs constitute a national resource in the Canadian health care system. They are a crucial part of the health care infrastructure in Canada. Thus, the federal government is particularly well positioned to sustain AHSCs across the country, through its well recognized roles in financing post-secondary education, funding health research, supporting health care delivery, financing health care technology and planning human resources in health care.”*<sup>106</sup>

We discuss in section 6.6 the role of the federal government as a funder of provincial/territorial programs through the Canada Health Transfer and other programs. It also supports research activities,<sup>107</sup> including funding national research agencies and programs; administers the Canada Health Act; provides health services directly to defined populations such as Canada's First Nations peoples; is the regulator of food, drugs, and medical devices; and provides health information through such bodies as the Public Health Agency of Canada, the Canadian Patient Safety Institute, and the Canadian Institute for Health Information.

In considering how best to reflect the role of the federal government in working with AHSNs to assist them in fulfilling their mission and mandate, the National Task Force has identified two areas that require further discussion and development: (1) the creation of an ongoing consultation mechanism between AHSNs and the federal government, and (2) opportunities where the federal government could support the mission of the AHSNs, which is discussed in 6.6 below. In each instance, provincial and territorial governments need to be integrally involved in the development of all AHSN – federal processes and programs.

In considering a mechanism for consultation at the federal level that supports the AHSN, the National Task Force would make it clear that this is in no way intended to supplant or diminish the constitutional responsibilities of the provinces and territories. Where there is an identified role for the federal government to invest in the tripartite mission of AHSNs, it must be done in close consultation with the provinces and territories and aligned with their priorities. The National Task Force is sensitive to the added complexity that is associated with establishing a mechanism that extends across two levels of government.

At the federal level, the three specific portfolios that, effectively, mirror the missions of AHSNs at the provincial and territorial level are Health Canada, Industry Canada and Human Resources and Skills Development Canada.

Given the range of policy issues where the federal government can support and complement the role of the provinces and territories (such as timely access to care, the future supply of health human resources, physical infrastructure, and coordinating science and technology policy across the health system to the marketplace) we believe that there is a need to improve the level of coordination across these portfolios with those national organizations who represent AHSNs.

There are also other policy fields where the federal government has a primary responsibility – such as public health, safety and security,<sup>108</sup> and services to First Nations and Inuit – where the development of an inter-portfolio consultation mechanism with AHSNs could lead to more effective information-sharing, policy coordination and formulation, and cost-effective outcomes.

Given the range of “horizontal” policy issues that cut across the three federal portfolios and missions of the AHSNs, the National Task Force believes that it is essential to create a federal, provincial and territorial consultation mechanism that facilitates meaningful discussion and contributes to more effective information-sharing and policy coordination. Any such mechanism must be sensitive to the constitutional responsibilities of the provinces and territories and ensure the full and active participation of all partners.

## **Recommendation 5**

*“The National Task Force recommends that the federal, provincial and territorial governments collectively recognize AHSNs as a national resource in the health system by working with the relevant national associations and bodies to create mechanisms through which AHSNs and federal ministries and agencies can more effectively communicate, share information and make decisions, and develop, coordinate and implement policies in collaboration with provincial and territorial governments.”*

## 6.5 Resourcing the AHSN: the Provincial and Territorial Role

Thus far, the recommendations in this chapter have focused on the need to develop integrated plans and strategies and effectively align structures within and between AHSNs and with relevant government bodies to improve patient and population health outcomes. While these priorities are vital to the future of the AHSN, they cannot be disconnected from a discussion on resourcing – with the provinces and territories playing a primary role in terms of overall stewardship, funding and accountability.

In this section, we discuss both the traditional challenges of funding a tripartite mandate in an AHSC as well as the issue of ensuring that the Network itself can achieve its full potential from a provincial and territorial perspective. Considering that the funding issues in traditional AHSCs have been known for many years and have been documented internationally in the literature, at a minimum, one should consider:

- The additional costs of the more complex patient population group that receives care within the AHSCs;
- The “surge capacity” that is needed to address rare and complex procedures if and when they need to be performed, or unanticipated public health crises;
- The extra time and workload needed for an experienced clinician to train others;
- The additional resources, tests, equipment, facilities and infrastructure that is needed for a new clinician, to learn and master both traditional and emerging diagnostic and treatment procedures, not to mention the need to assist trainees in responding to the human and emotional situations that take on a different meaning when they emerge from the textbook to the reality in which they become participants; and
- The workload, time, equipment and infrastructure needed to undertake and then integrate a research objective into the practice setting in a way that is ethical, controlled, and appropriate.

We discuss some of the specific funding issues associated with each of the three mandates.

As we move from the traditional AHSC to an AHSN model, the funding issues will likely become more complex. While organizations within a Network have collaborative intentions, we know that collaborations and networks often have “inertia” due to competing priorities of the member organizations and insufficient attention to resourcing and staffing the coordination and management elements of the Network’s process.

Having said this, we believe that AHSNs should be able to show the value they achieve with the funding they receive, which is often criticized and to some degree misunderstood for being higher compared to community health provider organizations. Including performance measures in their plans, as we have recommended, AHSNs will continue to demonstrate that they accept their accountability for wise and responsible stewardship of public funds and scarce resources.

Funders must also recognize and begin to address significant and legitimate resource problems among AHSNs and their members. Funding concerns – lack of alignment, fragmentation and in some instances inadequacy – together make up perhaps the biggest challenge they face. As provinces and territories seek to contain the growth of health care costs, AHSNs will need to work with their funding partners to address this challenge in ways that support better health care outcomes.

### Patient Care

In addition to the concerns about the level of patient care funding received by AHSNs and the relative complexity of patient care cases compared to community hospitals of similar size, one serious and long-standing concern is the practice whereby patient care resources subsidize other aspects of the AHSN mission, especially teaching as well as research. This happens at both the institutional and individual level:

- Hospitals are funded by global budgets allocated by the province/territory, and discretionary revenue they may earn from such sources as parking, space rentals and so on.<sup>109</sup> Internal resources are often diverted to teaching due to inadequate funding for these activities, which neither the global budget nor discretionary revenue is intended to fund; and

- Individual clinical faculty who teach students are paid for providing clinical services, either on a fee-for-service basis or through an alternate funding plan. While the latter may be designed to support teaching or research, in practice income from providing services subsidizes teaching. In some instances it may help to underwrite research. This can create conflict between the need to generate income, respond to escalating patient care demands with limited faculty resources, and teaching, and research and/or other academic obligations. As funding pressures and challenges continue, the potential for conflict in the allocation of resources between the three AHSN missions will likely increase.

## Education

Funding for the education mission is provided through a number of sources including provincial/territorial ministries, universities, healthcare organizations and clinical earnings of physicians.

The diverse funding sources for this component of the AHSN mission leads to a number of issues, including: the view that major parts of the education mission are seriously underfunded or simply unfunded. These shortfalls have traditionally been made up by the generous goodwill of healthcare professionals at academic healthcare organizations and physicians, without formal recognition of the time involved or the impact on clinical care delivery.

Furthermore, increasing enrollment in all professional health faculties and professional schools has not been adequately reflected in budgetary adjustments to AHSNs; thereby accentuating the critical shortfall in funding for education.

Today, however, health care organizations and professionals face escalating pressures to demonstrate cost-effectiveness and increased productivity. As a result, the model of volunteer clinical teaching and unfunded institutional support is becoming less sustainable. There is also conflict and confusion about who should pay for what. These issues can significantly slow the advancement of new educational approaches, including inter-professional education and collaborative models of care.

## Research

The issues around research funding are no less complex. Research funding comes from multiple sources, including health care organizations, discretionary revenues, university salaries, research operating and infrastructure grants, contracts with private-sector companies, health charities (including philanthropy), and, as noted, cross-subsidization from clinical services.

The federal government and their respective funding agencies, and the provincial and territorial governments also play a significant role in funding the direct, indirect and infrastructure needs of AHSNs.

There are a host of complex regulations regarding the use of each of these revenue sources. The potential for future conflict is significant as fiscal pressures increase and organizations become more concerned about the ability of Canadian investigators to compete globally with scientists who enjoy more stable and predictable research funding.<sup>110</sup>

## Infrastructure

Finally, the ability to deliver excellent patient care, teaching and research also depends on high-quality and properly maintained buildings and equipment. Canada's health care and educational systems face serious ongoing shortfalls in this area. Most of the infrastructure on which patients, clinicians, researchers, educators and students depend was built decades ago.

Budgets have not been adequate to replace and update outmoded equipment or buildings in need of repair. Ongoing pressures on operating budgets have even forced institutions to put off the needed upkeep of these assets. The practice of deferring maintenance leads inevitably to faster deterioration – triggering a vicious circle of accelerated replacement needs. Governments have a key role to play in helping these organizations, which are so critical to our health, safety and well-being, to bridge this gap.

We have concluded that as funding pressures and challenges escalate, the potential for conflict in allocation of resources among the three AHSN missions also increase and could threaten collegiality and even sustainability. More to the point, it may also stand in the way of the best possible outcomes for patients and the population at-large:

*“Academic health centers today are organized to take maximum advantage of a reimbursement system that has been described as perverse; perhaps one of the perversities is that the values embedded in the reimbursement system (reimbursement driven by discrete services rather than overall health or function) have been internalized by trainees and their institutions, and other things valuable to patients and communities (longitudinal care, coordinated care, and appropriateness of care) have become invisible.”<sup>111</sup>*

Our environmental scan supported this viewpoint:

*“... There needs to be an explicit focus on a patient-centered approach that links back to primary and secondary care – this might involve service-based funding that would cover both institutional and community-based care.”<sup>112</sup>*

*“The compensation system for health professional educators and scientists within the AHSC environment needs a complete evaluation. The system of payment for personnel should acknowledge team based care.”<sup>113</sup>*

Canada is not alone in dealing with this issue. Australia’s experience clearly indicates that *“better coordination is required to overcome fragmentation within the medical education system, to ensure appropriate recognition for teaching and research across all clinical settings.”<sup>114</sup>*

Understanding that the provinces and territories are the primary funder of AHSNs across the three missions, it is crucial to continue to develop an ongoing dialogue that not only allows for a full discussion of accountabilities and deliverables, but the level of required funding to ensure that they can be fully realized. Recommendation 4 can act as a catalyst to facilitate the necessary conversations that need to take place on a regular basis and serve to better align overall AHSN accountabilities, fragmented funding and expected outcomes.

## **Recommendation 6**

*“The National Task Force recommends that AHSNs and provincial and territorial governments ensure that the appropriate financial resources, mechanisms and programs are aligned to fulfill their agreed upon missions.”*

## **6.6 Investing in AHSNs: the Federal Role**

When it comes to financing health care in Canada, we fully recognize and appreciate the federal government’s cash contribution to the provinces via the Canada Health Transfer – which is currently growing at a rate of 6% per year, and accounts for close to one-quarter of all public monies invested in the health system. These funds, as set out in the 2004 First Ministers Accord, are transferred to the provinces, which have full flexibility in determining how to invest them across their health systems.<sup>115</sup> Effectively, these funds are to assist the provinces in ensuring that their health systems can respond to population and individual health needs in a timely fashion.

In addition, we recognize and strongly support the federal government’s significant contributions to health research and innovation in Canada. Through a suite of programs (Canadian Institutes of Health Research, Canada Research Chairs, Canada Foundation for Innovation, Networks Centres of Excellence, Indirect Costs Program, Centres of Excellence in the Commercialization of Research, to name a few), the federal government accounts for close to 80 cents of each public dollar invested in health research, including a significant portion of world-class infrastructure needed to support advanced research.<sup>116</sup> In short, ongoing federal investments in health research are essential to the AHSN mandate when it comes to medical discovery, knowledge creation, knowledge translation, innovation and commercialization.

Building on the above precedents, the creation of separate envelopes of funding could focus on specific elements of the mission of AHSNs – such as health human resources, health delivery infrastructure, health research infrastructure, sustainability strategies linked to national education issues, and health research in general.<sup>117</sup>

We propose that in addition to the Canada Health Transfer, the federal government should consider direct contributions to the areas in which they invest in AHSNs. There are precedents: the federal government has created time-limited, issue-specific funding mechanisms for the provinces and territories strategically targeted to accelerate system reform. Recent examples include the Health Transition Fund, two Medical Equipment Funds, and the Primary Health Care Transition Fund.

In the past, the federal government has played a critical role in the development of medical schools – with the creation of the Human Resources Fund Act in 1966, and the development of acute care capacity with the introduction of the Hospital Construction Grant Program in 1948. In each instance, the federal government worked closely and collaboratively with the provinces to develop additional training and delivery capacity in the health system.

A variety of public mechanisms could be used to generate and disburse funds supporting the social missions of [AHSCs]. As an example, the (Commonwealth Fund) Task Force has in the past advanced the concept of the Academic Health Services Trust Fund, a public authority that would provide explicit payments to [AHSCs] that participate in the production of public and merit goods (such as medical research and well-educated physicians).<sup>118</sup>

While provincial and territorial governments are the predominant funder of AHSNs, it will also be crucial to find ways in which investments by the federal government are aligned with local care-teaching-research priorities to provide maximum value. Regardless of the funding mechanism, discussions would be required among the federal, provincial and territorial governments and AHSNs to determine how any funding arrangement would effectively work and meet pre-determined common policy objectives.

In keeping with the views set out in section 6.4, we believe that Recommendation 5 would play a critical role in facilitating federal, provincial and territorial discussions with AHSNs.

## Recommendation 7

*“The National Task Force recommends that AHSNs and the federal government, in close consultation and mechanisms and programs are aligned with provincial and territorial government priorities, to fulfill their agreed missions.”*

## 6.7 Creating an International Forum for AHSNs

Globalization is a trend that can positively impact AHSNs who share lessons learned, innovations and ideas that contribute to enhancing their mission and mandate.

Canada and the United States have a long history of cross border collaboration in medical education at the undergraduate and post-graduate levels. Canadian investigators have played major roles in leading international clinical trials or in organizing trans-national efforts to share information (such as the Cochrane Collaborative). AHSCs themselves are recognized internationally as collaborators in patient care, education, research and relief efforts.

In the past, there have been trilateral meetings between leaders from American, British and Canadian AHSCs (led by the Association of Faculties of Medicine of Canada). The Macy Foundation and others have sponsored occasional western hemisphere and global meetings on medical education.

The Association of American Medical Colleges has identified “international engagement” as a strategic area for further consideration, having already concluded that international engagement is essential for the development of establishing a Forum is suggested for the international exchange of ideas, information and best practice on advancing academic health sciences. Although the concept has been enthusiastically endorsed – it has yet to take root. The Association of Academic Health Centers held an International Forum in 2009 that focused on the new global economy; models, missions risks and rewards for academic health centers.

In October 2009, Ernst & Young, McKinsey, the Netherlands Medical University Federation and Odgers Berndtson hosted the European Strategy and Governance in Academic Medical Centres Conference that brought together leaders from the United Kingdom, Netherlands, Sweden, Germany, Singapore and the United States to a compare and contrast discussion that enabled comparison across international experiences. Each representative was asked to respond to the same 8 questions in their presentation resulting in important learnings and options.<sup>119</sup>

Canada’s international reputation for excellence and as an “honest broker” positions it well to assume a leadership role in establishing such a forum and facilitating the uptake and dissemination of leading practices and lessons learned. This could take the form of an International Association for AHSNs like the International Hospital Federation, supported by a small organizing secretariat, housed by either the AHSNs or a national organization,<sup>120</sup> and jointly sponsored. Inviting the best and brightest minds in the world to visit Canada at regular intervals to share experiences, ideas and concepts on academic health sciences centres and their structures, processes and best practices can only help to enrich Canadian AHSNs and further contribute to Canada’s position as an international leader in the field.

We believe that implementation of the recommendation is an enabler to the vision we propose and would ensure that Canada's AHSNs are relevant, globally competitive, and properly positioned internationally to contribute our experiences to improving health, health care and health systems worldwide, and also benefit from the knowledge and best practices developed elsewhere.

### **Recommendation 8**

*“The National Task Force recommends that Canada’s Academic Health Sciences Networks and their national organizations create an international meeting place, or host an annual Forum, that brings together global leaders committed to the collective advancement of the issues and opportunities in the academic health sciences.”*



# 7. Moving Forward...Identifying Implementation Strategies

## 7.1 Bringing the Recommendations to Life

We recognize that the seven recommendations contained in this report will have a lasting and constructive impact only if they are linked to effective implementation strategies. In this section our intent is to provide the AHSN community and policy makers, with practical suggestions for how implementation may occur and to flag those issues and questions that are beyond the scope of this report. At the end of the report, we will provide a separate discussion on the opportunity for future work and potential next steps as it pertains to the overall report.

By implementation strategy, we mean the basic steps that all key stakeholders – AHSN bodies, governments, and national organizations – should follow to begin acting on our recommendations. This differs, we note, from setting out a detailed implementation plan that each network would have to follow. We have deliberately avoided that type of “one size fits all” approach, so that networks, their respective provincial/territorial governments, and the federal government can have maximum flexibility to tailor their responses to the varying circumstances and needs of each AHSN.

Looking at the implementation strategies, we make the following observations:

- Different elements target different levels within the health system. This reflects the fact that some of our recommendations are horizontal, and speaks to the need to work more effectively across the entities, such as universities and academic health care organizations, that comprise the AHSN. Others are vertical, and speak to the need for more collaborative and partner-driven relationships between AHSNs and governments (provincial/territorial and federal).
- All relevant organizations and interests must come to the table for meaningful discussion of the recommendations in an open and transparent environment with clear objectives and measurable outcomes.
- We encourage all AHSNs to develop and implement strategies that effectively communicate the value proposition that is offered to Canadians by explaining their role, the value they provide, and how they can optimize their performance.
- Finally, knowing that it will take time to digest and act upon the recommendations in the report, we propose a review of progress in two to three years to confirm what has – and has not – been accomplished. This should take place at a national forum to identify lessons learned to date, areas requiring more attention, and emerging best practices.

The balance of this chapter lists implementation strategies as they relate to each of our recommendations.

### Recommendation 1

*“The National Task Force recommends that all Academic Health Sciences Networks (AHSNs) ensure the existence of formal inter-organizational structures and mechanisms to support the development of integrated strategies, plans and policies, and ensure more effective planning, information-sharing, coordinated decision-making and policy implementation.”*

Embedded in this recommendation, which is directed at the AHSN community, are the notions of improved transparency, accountability and effective stewardship of some of our country’s most important public institutions. It will be very important for AHSNs to consider how to develop local mechanisms that will achieve this, while strengthening governance of the network itself. At the same time, new governance approaches will require more formal recognition of who is to be included in the AHSN. Accordingly:

- AHSNs should function as partnerships between healthcare organizations, universities and, where appropriate, other educational institutions;
- A series of objective criteria should be established to help determine which organizations should be part of the AHSN;
- AHSNs should complete formal evaluations of current structures to confirm what changes are required to successfully achieve the goals of integrated plans and strategies;



- Where existing mechanisms will be kept, AHSNs should ensure that these are properly defined and their objectives clearly articulated, and that all parties understand their provisions; and
- Where needed, AHSNs should create appropriate formal inter-organizational structures that align with integrated plans and strategies.

Potential challenges and enablers to the process may include:

- Ensuring that there is clarity on the specific goals that each AHSC/N is hoping to achieve within the overall context of integrating the three mandates. These may differ by region;
- Clearly delineating the individual responsibilities and deliverables of the AHSN in relation to other organizations, particularly regional health authorities;
- Identify the source or at a minimum, the mechanism to fund specific AHSN-specific projects (e.g., pain control or stroke management strategies);
- Understanding that aligning the incentives and communicating clearly what the expected benefits will be in order to identify those organizations who should consider being part of the Network;
- Determining and utilizing metrics that can contribute to the development of meaningful goals, inform discussions and help to monitor progress;
- Having clarity on the inclusion, membership and needed players to achieve the goals that have been identified; and
- Re-examining existing models and potentially implementing a series of pilots across the country to ensure that emerging models are sufficiently robust and don't introduce their own problems.

## Recommendation 2

*“The National Task Force recommends that each of Canada’s AHSN commit to developing integrated plans and strategies that will:*

*a. Guide its overall process of transforming to the network model; and*

*b. Achieve the vision of the AHSN set out in this report (which is “to improve the health of Canadians and enable Canada to be a global leader in health care, education and research”) by:*

- *Leading the development of innovative and value-added health care services, education and research, evaluation and knowledge translation,*
- *Accelerating the dissemination of research-based evidence into clinical practice to implement leading practices to enhance the quality, accessibility and affordability of health care services and improve patient and population health outcomes;*
- *Integrating innovative collaborative models of education with health care delivery and research; and*

*c. Identify appropriate performance measures to assist in monitoring their progress and performance.*

In our view, implementation of this recommendation must begin at the level of individual AHSNs. Accordingly:

- All academic health care organizations within an AHSN should identify and agree on their respective roles and responsibilities from a health care services, education and research standpoint;
- Each university and its relevant faculties should work with their affiliated academic healthcare organizations to ensure that all students are trained in an environment that effectively integrates education, health care delivery and research;
- Once the AHSN has clarified roles and responsibilities, it should engage in broader discussions with other AHSNs, particularly within its province or territory, to minimize overlaps and make the most of complementary roles;

- These discussions should also focus on the development and implementation of uniform benchmarks, standards and metrics to help monitor progress and performance within and across AHSNs;
- Each AHSN should develop a fully integrated plan and strategies, including goals, benchmarks, standards, metrics and reporting processes; and
- Each AHSN should identify the resources required to execute the plan and meet with its provincial or territorial government to discuss a path forward.

Potential challenges and enablers to the implementation of this recommendation may include:

- Engaging a sophisticated leadership that can address and manage the complexity inherent in the AHSC/N evolution and integration;
- Ensuring a respectfulness of the regional planning and provincial functions and engaging support and leadership from these bodies early in the process;
- Identifying areas where silos of patient care, research and training exist and focus on improving the integration of these mandates;
- Beginning with a clearly crafted and shared understanding of the specific goals that are to be achieved;
- Explicitly recognizing and addressing how concerns regarding organizational autonomy, branding, and the role of foundations and philanthropy will be addressed;
- Ensuring that there is up front consideration for how the planning will be resourced;
- Setting terms of reference for expectations, roles, and rights of the players involved;
- Ensuring that there is due consideration to the time, leadership and cost of these discussions and their implementation; and
- Identifying and leveraging successful models from other jurisdictions or countries that can be used as a guide or example.

### Recommendation 3

*“The National Task Force recommends that the relevant national associations establish the appropriate structures, processes and forums for Canada’s AHSNs to meet on a regular basis. The objectives of these meetings would be: (1) to strengthen AHSN relationships; (2) to identify gaps or duplication in their mandates, plans, policies and/or programs; and (3) to share lessons learned and leading practices.”*

This recommendation may prove particularly important in light of the different paces at which conversations about implementing our recommendations are likely to unfold across the country. Accordingly:

- The Association of Universities and Colleges of Canada, the Association of Faculties of Medicine of Canada, the Academy of Canadian Executive Nurses, the Association of Canadian Academic Healthcare Organizations, and others should meet to determine a path forward.

Potential challenges and enablers to the implementation of this recommendation may include:

- Defining a membership or participation criteria which is both inclusive but sufficiently deliberate in order to achieve meaningful and focussed outcomes;
- Leveraging the effect of a national approach to provide both substantive support and a motivational framework to individual regions and AHSCs/Ns;
- Helping government to understand what the roles of various players are in order to enable government itself to define its role; and
- Consider the creation of an inter-organizational secretariat to facilitate the work of the partners and keep a deliberate focus on developing national mechanisms.

## Recommendation 4

*“The National Task Force recommends that AHSNs work with their respective provincial and territorial governments to create mechanisms through which AHSNs and all relevant ministries can more effectively communicate, share information and make decisions, and develop, coordinate and implement policies.”*

This recommendation underlines that we are talking about a new way of working more collaboratively in strategic partnership to improve the functioning of all three missions of the AHSN. Accordingly:

- AHSNs should consider whether the mechanism should involve engaging with all relevant ministries together, each one separately, or taking a combined approach;
- In provinces with multiple AHSNs, these networks should work together to determine their goals for this proposed mechanism, the kind of structure(s) and resources required to sustain it, and how they will collectively engage government; and
- We have already discussed, under Recommendation 2, the need for performance benchmarks, standards, metrics and reporting processes within AHSNs and possibly across them. These tools, if designed properly, would provide ministries with a more complete picture of what AHSNs accomplish across all three elements of their mission. This aligns with new approaches that look at over-all outcomes of government investments, not just specific outputs.

Potential challenges and enablers to this function may include:

- Ensuring that relationships within the relevant ministries and departments are continuous (i.e., that there are mechanisms to develop a longer-term history);
- Helping government to understand the value proposition, goal, and economic benefit of the integrated mandate and of participating in the initiative;
- Providing a set of accountability measures for the process;
- Clarifying for government, what the role of each player is and what their own role may be;
- Ensuring that the leadership and membership from AHSN members is at a sufficiently high enough level to foster subsequent changes and commitment to the implementation;
- Identifying the deliberate integrative structures and mechanisms of the three mandates to come together and result in changed outcomes; and
- Identifying and starting with budget and resources for coordination.

## Recommendation 5

*“The National Task Force recommends that the federal, provincial and territorial governments collectively recognize AHSNs as a national resource in the health system by working with the relevant national associations and bodies to create mechanisms through which AHSNs and federal ministries and agencies can more effectively communicate, share information and make decisions, and develop, coordinate and implement policies.”*

We are very sensitive that this recommendation could be viewed as overstepping our bounds, and might be seen as undermining or displacing the constitutional role the provinces and territories occupy in terms of being stewards of their health and education systems. This is not the intent.

The intent of the recommendation is to highlight the need for more effective coordination of the role of the federal government vis-a-vis AHSNs, while fully appreciating the primacy role of the provinces and territories. As a prerequisite, this would see the provinces and territories, and the AHSN community, working in close consultation with the federal government.

Accordingly, and similar to the spirit of Recommendation 4:

- The national organizations representing the AHSN community should first meet to determine the objectives they would like to achieve with this proposed mechanism;
- The AHSN community should share and discuss their objectives with provinces and territories and possible mechanisms to achieve them; and
- The AHSN community and the provinces and territories would then meet with the federal government to discuss goals and possible mechanisms, and options for achieving them.

Potential challenges and enablers may include:

- Ensuring that relationships within the relevant ministries and departments are continuous (i.e., that there are mechanisms to develop a longer-term history);
- Helping government to understand the value proposition, goal, and economic benefit of the integrated mandate and of participating in the initiative;
- Providing a set of common goals and accountability measures for the process;
- Beginning with a consolidation of the evidence and data that helps to drive strategic policy-making decisions at the local, regional, provincial and national levels;
- Ensuring that the leadership and membership from AHSN community and government is at a sufficiently high enough level to foster substantive dialogue and commitment to implementation;
- Identifying the deliberate integrative structures and mechanisms of the three mandates to come together and result in changed outcomes; and
- Identifying and starting with budget and resources for coordination.

## Recommendation 6

*“The National Task Force recommends that AHSNs and provincial and territorial governments ensure that the appropriate financial resources, mechanisms and programs are aligned to fulfill their agreed upon missions.”*

This recommendation underscores the need to ensure that all three aspects of the AHSN mission need to be effectively resourced, mainly by the provinces and territories, if they are to achieve their vision. Accordingly:

- AHSNs should develop requests for funding that are closely aligned to their missions and the expected outcomes they intend to achieve through the integrated plans and strategies;
- New funding opportunities and mechanisms should be considered where this would improve the overall alignment of incentives within the AHSN and in light of overall goals for improved patient and population health outcomes; and
- The measurement tools discussed in the implementation of Recommendation 2 would be helpful in explaining how well AHSNs perform in each area of their mission. This would require, however, much better collection and analysis of data than at present.

Potential challenges and enablers may include:

- Developing communication materials that explain the compelling “end game” of AHSNs, including the vision, benefits, and business case framed as solutions to system issues and challenges (i.e., access to care, quality and patient safety, health human resource shortages, research, innovation and economic benefits); and
- Developing a clearer sense of the evidence (e.g., benchmarks and indicators) that exists and the evidence that is needed in order to service provision, promote scholarship and investigation.

## Recommendation 7

*“The National Task Force recommends that AHSNs and the federal government, in close consultation and ongoing dialogue with the provinces and territories, ensure the appropriate federal financial resources, mechanisms and programs are aligned with provincial and territorial government priorities, to fulfill their agreed missions.”*

This recommendation underscores the need to ensure that all three aspects of the AHSN mission need to be effectively resourced, mainly by the provinces and territories, but where appropriate by the federal government, if they are to achieve their vision.

- AHSNs should develop requests for funding that are closely aligned to their missions and the expected outcomes they intend to achieve through the integrated plans and strategies, and are complementary to provincial and territorial priorities and funding mechanisms;
- New complementary funding opportunities and mechanisms should be considered where this would improve the overall alignment of incentives within the AHSN and in light of overall goals for improved patient and population health outcomes;
- The funding roles of the provinces and territories, and that of the federal government, should be clearly articulated and, where possible, seamless; and
- The measurement tools discussed in the implementation of Recommendation 2 would be helpful in explaining how well AHSNs perform in each area of their mission. This would require, however, much better collection and analysis of data than at present.

Potential challenges and enablers may include:

- Developing both individual and national communication materials that explain the compelling “end game” of AHSNs, including the vision, benefits, and business case framed as solutions to system issues and challenges (i.e., access to care, quality and patient safety, health human resource shortages, research, innovation and economic benefits);
- Developing a clearer sense of the evidence (e.g., national benchmarks and indicators) that exists and the evidence that is needed in order to service provision, promote scholarship and investigation; and
- At the federal level, is there an opportunity to initiate a planning cycle prior to the expiration/renewal of the 2004 First Ministers’ Health Accord?

## Recommendation 8

*“The National Task Force recommends that that Canada’s Academic Health Sciences Networks and their national organizations create an international meeting place, or host an annual Forum, that brings together global leaders committed to the collective advancement of the issues and opportunities in the academic health sciences.”*

In the spirit of looking outward with others, the National Task Force believes that the time is right for Canada to take a leadership role and create a viable mechanism that brings together the international AHSN community on a regular basis to learn from one another, and build new international relationships and partnerships that are strategic in nature.

Accordingly:

- The appropriate national stakeholder organizations in Canada should meet to confirm the level of interest in supporting this initiative;
- Assuming there is agreement and support, Canada should host a meeting with other interested countries to discuss the potential of this initiative, and a path forward; and
- If there is continued support for the initiative, a draft proposal should be developed and circulated to a broader number of countries to elicit their interest. The draft proposal should include defined objectives and outcomes, membership, and resourcing, amongst others.

Potential challenges and enablers may include:

- Structuring an agenda and identifying questions that are sufficiently answerable and salient to enable a useful and fertile discussion;
- Identifying the optimal mix of participants for meaningful discussion and outcomes;
- Enabling the dissemination and communication of the key lessons learned and findings across the system and within the international community;
- Utilizing the international forum as an opportunity or timeline for completing demonstration and pilot projects in order to report back, obtain feedback and continue progress on key initiatives; and
- Considering the use of technology to cut across cost and geographical barriers.

## 7.2 How Do the Pieces Fit Together?

In considering how to implement the recommendations in the report, we fully acknowledge that a number of complex relationships need to be more clearly defined. As well, all parties need to agree on what constitutes effective engagement, the outcomes and deliverables that might be achieved, and the timelines and resources required for implementation.

We believe that the discussions on how to move forward will likely occur:

- Among partners within the AHSN at the local level;
- Between AHSNs and their respective provincial and territorial governments;
- Among AHSNs and provincial/territorial and the federal governments; and
- Among AHSNs, the public and the media.

We have not set out a specific sequence, timelines or resources for implementation, understanding that each province and territory, along with its AHSN community, are at different points and will advance the conversation at differing paces.

While discussions within each AHSN will be crucial, it will also be essential for AHSNs to develop a common framework for interaction with their respective provincial and territorial governments, and in concert with the national AHSN community, the provinces and territories, to develop an effective dialogue with the federal government.

Combined, the eight recommendations are a means to an end: to improve patient and population health outcomes by providing Canadians with the best possible health care, education and research.

## 7.3 Opportunities for Future Work

We were asked to prepare this report as the renewal of a conversation and a potential blue print for the future of AHSCs in Canada. Through this report, we have offered and discussed eight recommendations that will leverage an existing Canadian resource to better integrate three mandates and achieve benefits for health, health care and the economy.

In so doing, we have synthesized and drawn on the existing literature, published and learned from cases from across the country, as well as from international experiences, and most importantly consulted with an extensive and impressive range of leadership from Canada's AHSCs. We have also recognized the complexity of implementation and the leadership required for the transformational change that we propose.

However, in spite of the complexity of implementation issues we believe that the value proposition itself, of leveraging an existing resource by better integrating patient care, research and training and extending it across the Canadian context, is a concept that can and should be made as real and as accessible as possible to those policy makers who hold significant funding levers but who may not be familiar with the domain or recognize their potential role in it. This may be achieved by extracting and tailoring some of the contents of this report and related materials and applying it to the various milieu that make up the Canadian landscape.

Second, while we have provided a high level discussion on the specifics of the value proposition and of the funding issues, it will be important to develop more detailed accounts and descriptions of both the benefits and the costs and resource implications of a tripartite mandate. This level of detail will be required as the discussion evolves.

Third, we have discussed the need for performance metrics that will help organizations achieve the vision that is proposed. As with the development of any indicator set, this is a complex and important undertaking that needs to be structured and evolved with the appropriate leadership, research, resources and technical expertise.

Finally, in keeping with the underlying purpose of integrating patient care, research and training we believe that the potential of Canada's AHSNs can and must be made known and accessible to patients, families, community members and citizens-at-large. This will provide the opportunity to engage the principal users in the evolution of the national resource that is intended for their benefit and with a view to providing added accountability to the size, scope and importance of the mandates at play.

## 8. Concluding Comments

*“Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world. Science is the highest personification of the nation because that nation will remain the first which carries the furthest the works of thought and intelligence.” – Louis Pasteur*

This report has laid out the work – some of it significant – that must happen in the coming years to turn Canada’s emerging AHSNs from a fragmented assortment of regionally-based organizations into a dynamic, coordinated and adequately funded national resource.

It has also shown why this work must be done: without a clear future to which its partners and funders all commit, the unique value of these key pieces of our health system – the true “engines of innovation” – will inevitably diminish. At a time of growing pressure from health care needs, Canada cannot afford this.

Already, however, long-standing relationships between important partners in the care-teaching-research enterprise are under strain. There is strong evidence that the existing model has not fully adapted to sweeping changes in teaching approaches, patient care and expectations around research commercialization. Canada risks slipping from its position of global leadership in delivering on the care-teaching-research mandate.

We believe the solution lies in recognizing and embracing change that better integrates AHSNs in their changing environments. The recommendations and implementation strategies we have laid out do not attempt to preserve the traditional model characterized by a close and somewhat exclusive relationship between the medical school and the teaching or research hospital. On the contrary, they invite participants to embrace new opportunities offered by the model of an academic health sciences network: in particular, the opportunity to advance teaching, care and research in new and more collaborative ways. The result, we strongly believe, will be a wealth of benefits for Canadians: introducing new models that improve patient outcomes and quality of care; ensuring that health professional training is relevant and inter-disciplinary; promoting evidence-based best practices; and helping to move discoveries from labs and into care settings more quickly and effectively.

By taking the path we have laid out, Canada’s education, research and health institutions and its governments will build a sustainable foundation for individual networks across the country and for a “network of networks” that will improve the focus and cost-effectiveness of our health care investments. Together, this country’s 17 Academic Health Science Networks have the potential to emerge as world leaders in this exciting new model of patient care and health services delivery, professional education, and research.



# Appendix A

## List of National Organizations Supporting AHSC-NTF Process

1. Academy of Canadian Executive Nurses
2. Association of Canadian Academic Healthcare Organizations
3. Association of Faculties of Medicine of Canada
4. Canadian Association of Interns and Residents
5. Canadian College of Health Service Executives
6. Canadian Council of Health Services Accreditation
7. Canadian Dental Association
8. Canadian Federation of Medical Students
9. Canadian Healthcare Association
10. Canadian Institutes of Health Research
11. Canadian Medical Association
12. Canadian Nurses Association
13. Canadian Association of Paediatric Health Centres
14. Canadian Pharmacists Association
15. Canadian Physiotherapy Association
16. Canadian Psychological Association
17. College of Family Physicians of Canada
18. Research Canada...An Alliance for Health Discovery
19. Federation of Medical Regulatory Authorities of Canada
20. Medical Council of Canada
21. Royal College of Physicians and Surgeons of Canada
22. Society of Rural Physicians of Canada

## Appendix B

### Select World's Firsts & Other Major Medical Breakthroughs in Canada's Academic Health Sciences Centres

Taken from "Eureka! World's First Discoveries and Other Major Medical Breakthroughs in ACAHO Member Institutions". Association of Canadian Academic Healthcare Organizations, 2008. It is important to note that the scientists and clinicians who undertake research within ACAHO member institutions will have a cross appointment to their affiliated University.

- 1877** Introduction of sterilized cotton wool swabs in test tubes (reducing contamination). (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1907** First bronchoscopy performed. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1908** Installation of the first milk pasteurization plant in Canada, 30 years before it becomes mandatory. This all but eliminates diseases transmitted by unpasteurized milk like tuberculosis, salmonella, and e.coli. Pasteurization dramatically decreases infant mortality in Canada. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1912** First surgical treatment of tuberculosis. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1919** Researchers at the Hospital for Sick Children become pioneers in blood transfusions for children. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1922** First clinical use of insulin for diabetes in human patients. (*University Health Network — Toronto, Ontario*)
- 1930** Development of a new infant cereal that later becomes famous internationally as "pablum". This fortified cereal (the first of its kind) significantly reduces death from malnutrition. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1933** First excision of the entire lung performed (pneumonectomy). (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1935** First clinical use of Heparin as a blood thinner. (*University Health Network — Toronto, Ontario*)
- 1935** Researchers study lead poisoning in children, resulting in the prohibition of lead pigments in paints on children's toys and furniture. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1939** Invention of the corneal splitting knife (still standard in surgery to reduce pressure in glaucoma). (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1946** Design and use of North America's first artificial kidney. (*University Health Network — Toronto, Ontario*)
- 1948** Development of the first artificial kidney machine. (*Lawson Health Research Institute — London, Ontario*)
- 1948** First 25 million electron-volt beta-tron to be established in any university or hospital – calibration takes nine months. The electron-volt beta-tron is used for cancer research and to improve treatment accuracy. (*Saskatoon Health Region — Saskatoon, Saskatchewan*)
- 1948** Physician researchers first recognize sexual dimorphism in human cells. This discovery leads to knowledge of the relationship of sex chromosome abnormalities to disease. (*London Health Sciences Centre — London, Ontario*)
- 1950** Introduction of lumpectomy for treatment of Breast Cancer. Lumpectomy is a surgical procedure designed to remove a discrete lump (usually a tumor, benign or otherwise) from an affected woman or man's breast. (*University Health Network — Toronto, Ontario*)
- 1950** Use of total body cooling as a method of making heart surgery safer. (*University Health Network Toronto, Ontario*)
- 1950** First neuro-surgical treatment of epilepsy performed. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1950** Use of first regulated cardiac pacemaker. (*University Health Network — Toronto, Ontario*)

- 1951** First use world-wide of calibrated cobalt-60 for cancer radiotherapy treatment. (*Saskatoon Health Region — Saskatoon, Saskatchewan*)
- 1951** First “cobalt bomb” in the world used to deliver radiation therapy to cancer patients. (*Lawson Health Research Institute — London, Ontario*)
- 1951** Use of radiation to cure Hodgkin’s disease. (*University Health Network — Toronto, Ontario*)
- 1952** First use of a device that determined whether or not a patient’s thyroid is cancerous through the use of radioactive iodine. (*Saskatoon Health Region — Saskatoon, Saskatchewan*)
- 1956** Major breakthrough in virology by discovering that positive strand Ribonucleic Acid (RNA) could be infectious. (*Capital Health/University of Alberta — Edmonton, Alberta*)
- 1957** Invention of the artificial cell for application in medicine and biotechnology. It was thought that artificial cells could one day be used as a partial substitute for human cells and organs. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1958** World first surgical treatment on cerebral aneurysms. (*Lawson Health Research Institute — London, Ontario*)
- 1960** Implementation of genetic screening programs for hereditary metabolic diseases in newborns. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1960** First implanted mammary artery into the heart wall in order to restore functionality of the heart. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1961** Discovery of blood forming stem cells enabling bone marrow transplants. (*University Health Network — Toronto, Ontario*)
- 1963** The first widely successful surgery to correct the birth defect known as “Blue Babies” is performed. Before this procedure, this condition used to kill 9 out of 10 patients in their first year. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1965** Researchers develop a lab procedure that cuts the time required to diagnose whooping cough from five days to thirty minutes. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1965** First artificial knee joint in the world created. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1968** Identification of antibodies that led to the virtual elimination of Rh disease that affected 10% of babies of Rh-negative women and a significant cause of death in these newborns. (*Winnipeg Children’s Hospital/University of Manitoba— Winnipeg, Manitoba*).
- 1969** Discovery of a carcino-embryonic antigen – a tumor marker for cancer. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1970** Discovery that hereditary metabolic diseases could be treated with vitamins. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1971** Developed the world’s first paediatric electric prosthetic arm. (*Bloorview Kids Rehab — Toronto, Ontario*)
- 1975** Development of software used worldwide for 20 years to control radiation therapy. (*University Health Network — Toronto, Ontario*)
- 1976** Identification of P-glycoprotein as a major cause of cancer drug resistance. (*University Health Network — Toronto, Ontario*)
- 1978** Developed the internationally-recognized AeroChamber, a medical device used to administer aerosolized medication for patients with asthma. This device continues to be used in practice around the world. (*St. Joseph’s Healthcare — Hamilton, Ontario*).

- 1978** Discovery of reversibility of brain damage from alcohol with abstinence. (*University Health Network — Toronto, Ontario*)
- 1979** Invention of a radically different ventilator (now used worldwide) that gently “shakes” oxygen into the lungs of children with severe lung disease, sparing many of them painful lung bypass procedures. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1979** “Continuous Passive Motion” (CPM) – a revolutionary treatment for injured or diseased joints is developed. Before this treatment, patients with damaged cartilage had to be totally immobilized. CPM is such an improvement that it is now being used in 17,500 hospitals in more than 77 countries world-wide. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1980** Initial studies using real time ultrasounds and detailing biological factors affecting human fetal behavioral activity and breathing movements. (*Lawson Health Research Institute — London, Ontario*)
- 1981** World first heart operation to correct a life-threatening heart condition known as right ventricular dysphasia. (*Lawson Health Research Institute — London, Ontario*)
- 1983** Successful single lung transplant. Lung transplants extend life expectancy and enhance the quality of life for end-stage pulmonary patients. (*University Health Network — Toronto, Ontario*)
- 1983** The Department of Nuclear Medicine becomes to use a special imaging agent to diagnose Parkinson’s disease. Called [18] F6-fluorodopa PET, the chemical was produced by Hamilton Health Sciences and is now used worldwide. (*Hamilton Health Sciences/McMaster University — Hamilton, Ontario*)
- 1984** Discovery and cloning of the T-Cell receptor genes, significant in the field of immunology. (*University Health Network — Toronto, Ontario*)
- 1986** First successful double lung transplant. (*University Health Network — Toronto, Ontario*)
- 1986** Developed first predictive testing for late onset genetic diseases (Huntington Disease). (*Provincial Health Services Authority — Vancouver, British Columbia*)
- 1986** Discovery of the SH2 domain, which controls the ability of proteins to interact with other SH2 containing proteins and thereby direct the function of enzymes involved in transmitting cellular signals. This finding has revolutionized our understanding of how proteins form signaling pathways inside cells. It is already informing research to control these pathways in diseased cells – the basis for novel therapies. (*Mount Sinai Hospital — Toronto, Ontario*)
- 1987** First aortic valve replacement in the world using the Toronto Heart Valve, which is now used worldwide. (*University Health Network — Toronto, Ontario*)
- 1987** The gene responsible for Duchenne Muscular Dystrophy is identified. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1987** World’s first pace-maker cardioverter defibrillator is implanted. (*Lawson Health Research Institute — London, Ontario*)
- 1988** Researchers solve the structure of rennin – a key enzyme in the kidney that plays a role in the development of high blood pressure. (*Capital Health/University of Alberta — Edmonton, Alberta*)
- 1988** Gene defect that causes Tay-Sachs disease is identified. (*The Hospital for Sick Children — Toronto, Ontario*)
- 1988** World’s first successful liver/small bowel transplant is performed. (*Lawson Health Research Institute — London, Ontario*)
- 1989** Researchers develop sputum induction techniques and sputum cell analysis. Their research on nasal mucosa suggested ways in which the cellular response to antigen challenge might be studied in bronchial mucosa and sputum. (*St. Joseph’s Healthcare — Hamilton, Ontario*).
- 1989** Development of the first oral treatment for Hepatitis B, resulting in the drug Lamivudine. (*Capital Health/University of Alberta — Edmonton, Alberta*)

- 1989** Discovery of the gene which, when defective, causes cystic fibrosis – the most fatal genetic disease killing Canadian children today. (*Hospital for Sick Children — Toronto, Ontario*)
- 1990** First measure of neurotransmitter concentration in schizophrenics by Magnetic Resonance Spectroscopy (MRS). MRS allows scientists and doctors to measure chemicals within the body and brain without removing tissue or blood samples and without using dangerous radioactive ‘tracers’. It is therefore safe and can be used repeatedly without any ill effects on the patient. (*Lawson Health Research Institute — London, Ontario*)
- 1991** Publication of the first paper demonstrating that treatment of obstructive sleep apnea by nasal continuous positive airway pressure (CPAP) in patients with congestive heart failure improves cardiac function and symptoms of heart failure is published. This discovery has major implications because it suggests that obstructive sleep apnea contributes to the development and progression of congestive heart failure. (*Toronto Rehabilitation Institute — Toronto, Ontario*)
- 1991** Researchers at Sunnybrook invent and license the world’s first high frequency ultrasound microimaging scanner for preclinical imaging. This scanner is now used around the world for research applications and clinical imaging of the eye to detect glaucoma and anterior segment tumors. (*Sunnybrook Health Sciences Centre — Toronto, Ontario*)
- 1992** Discovery of the first gene responsible for Fanconi anemia. Fanconi anemia (FA) is a rare genetic disease that affects children and adults from all ethnic backgrounds. FA is characterized by short stature, skeletal anomalies, increased incidence of solid tumors and leukemias, bone marrow failure (aplastic anemia), and cellular sensitivity to DNA-damaging agents such as mitomycin C. (*Hospital for Sick Children — Toronto, Ontario*)
- 1993** Researchers demonstrate that mouse embryonic stem cells are capable of supporting the entire embryonic development and in fact creating completely cell cultured derived mice. (*Mount Sinai Hospital — Toronto, Ontario*)
- 1993** The International Digital Mammography Development Group is formed. This collaboration of leaders in breast imaging has made dramatic breakthroughs in developing new technologies to detect breast cancer. (*Sunnybrook Health Sciences Centre — Toronto, Ontario*)
- 1993** Discovery of a novel gene associated with Lou-Gehrig’s disease. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1994** World’s first 3-D ultrasound-guided cryosurgery. (*Lawson Health Research Institute — London, Ontario*)
- 1994** Solved the 30-year old puzzle of why so many people suffer an allergic reaction when they receive blood transfusion. (*Hamilton Health Sciences/McMaster University — Hamilton, Ontario*)
- 1995** First physical map of the human genome created. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1995** Discovery of the gene associated with localized muscular dystrophy. (*McGill University Health Centre Research Institute — Montreal, Quebec*)
- 1995** Discovery of the Inhibitor of Apoptosis (IAP) gene family. The IAPs serve as integrators of cell survival decisions. IAP modulation represents a novel and potent mode of chemotherapy (*Children’s Hospital of Eastern Ontario — Ottawa, Ontario*)
- 1996** Identification of a human blood cell that regenerates the entire blood system. This discovery enabled the development of new treatments for blood diseases such as leukemia, thalassemia and sickle cell anemia. (*Hospital for Sick Children — Toronto, Ontario*)
- 1996** Identification of a gene that causes colon cancer. Colorectal cancer is the second leading cause of cancer-related deaths among Canadians. (*Hospital for Sick Children — Toronto, Ontario*)
- 1996** The Consort statement, the internationally accepted standards for the design of the randomized control trial (RCT), was formulated by a group of scientists. It is now accepted by over 600 medical journals and is the sine qua non for performing RCTs. (*Children’s Hospital of Eastern Ontario — Ottawa, Ontario*)

- 1998** Developed the first trophoblast stem cells – the precursors of cells that form the placenta. Since the placenta is critical for a successful pregnancy, this discovery will have a major impact on research to understand and ultimately prevent pregnancy complications resulting from a failure in normal placental function. (*Mount Sinai Hospital — Toronto, Ontario*)
- 1998** Discovery of the first gene that causes Lafora disease – one of the most severe forms of teenage onset of epilepsy. (*Hospital for Sick Children — Toronto, Ontario*)
- 1999** Imaging scientists develop the world’s first method to image blood flow in the microscopic vessels in the muscle of the heart in real-time, a technique now used internationally. An accurate view of the cardiac microscopic vessels is critical to improving diagnosis of and treatment for heart attacks. (*Sunnybrook Health Sciences Centre — Toronto, Ontario*)
- 1999** Identification of ABCA-1 gene – key regulator of HDL concentrations in humans. (*Provincial Health Services Authority/BC Children’s Hospital — Vancouver, British Columbia*)
- 1999** First islet transplant under the Edmonton protocol for Type I Diabetes. Islet transplantation has been previously performed under other protocols; however, the Edmonton protocol has produced levels of success that are unprecedented in the field of islet transplantation. (*Capital Health/University of Alberta — Edmonton, Alberta*)
- 1999** World’s first closed chest robotic-assisted beating heart coronary artery bypass graft conducted. (*Lawson Health Research Institute — London, Ontario*)
- 2000** Researchers show that much lower doses of chemotherapy in combination with antiangiogenic drugs (drugs that stop the development of blood vessels in tumors) will significantly delay tumor progression in animal models. Clinical trials are underway to validate these results in Ontario and around the world. If successful, this treatment would have less severe side effects than conventional treatments, and it could help to prevent drug resistance. (*Sunnybrook Health Sciences Centre — Toronto, Ontario*)
- 2000** Discovery on the mechanism of formation of amyloid, the basis of Alzheimers and other diseases, and the subsequent development of drugs to treat this. (*Kingston General Hospital — Kingston, Ontario*)
- 2001** Discovery that a protein called Interleukin 13 fuels the growth of Hodgkin’s lymphoma. (*University Health Network — Toronto, Ontario*)
- 2001** Discovery of a clinical rule that may reduce use of unnecessary x-rays for low-risk neck injuries and could aid in reducing use of imaging tests in alert and stable patients. (*Ottawa Health Research Institute — Ottawa, Ontario*)
- 2001** Identified the emerging role that albuminuria as an important risk factor for both kidney and heart disease. (*Hamilton Health Sciences/McMaster University — Hamilton, Ontario*)
- 2001** Development of the first animal model for Hepatitis C in mice, using transplanted human cells, providing a convenient way to test new treatments for Hepatitis C. (*Capital Health/University of Alberta — Edmonton, Alberta*)
- 2001** Tissue factor is a cell surface membrane protein involved in the initiation of blood clotting. Over expression or increased activation of tissue factor can increase the risk of cardiovascular disease. The research group demonstrated that over expression of GRP78 (a protein), can block the coagulant activity of tissue factor in human cells. These studies are important because they have identified a relevant cellular factor that can mediate tissue factor activity. (*Hamilton Health Sciences Centre — Hamilton, Ontario*)
- 2002** Deduction of the structure of a molecular complex in the brain involved in many functions including memory and learning. (*University Health Network — Toronto, Ontario*)
- 2002** Pioneered the use of Botulinum Toxin A to reduce upper limb spasticity in children with cerebral palsy. (*Bloorview Kids Rehab — Toronto, Ontario*)
- 2002** Introduction of revolutionary medication doses for depression and schizophrenia through positron emission tomography (PET) technology. (*Centre for Addiction and Mental Health — Toronto, Ontario*)



- 2002** Creation of a simple system to generate T-cells in a Petri dish. T-cells are a vital component of the immune system that orchestrate, regulate and coordinate the overall immune response. This discovery provided a method to create model systems to study the genetics and molecular biology of T-cell development and points to future clinical therapies for people whose immune systems have been destroyed, for example, by HIV or toxic cancer therapies. *(Sunnybrook & Women's Research Institute — Toronto, Ontario)*
- 2002** Discovery that a type of self-destructing “suicide cell” activity, previously believed to only be detrimental, is in fact necessary for the proper formation of muscle tissue. *(Ottawa Health Research Institute — Ottawa, Ontario)*
- 2002** Demonstration that dense breast tissue, a major risk factor in breast cancer, is mainly determined by genetic factors. *(University Health Network — Toronto, Ontario)*
- 2002** Researchers find a relationship between environmental tobacco smoking (second hand smoke) and a heightened risk of Sudden Infant Death Syndrome (SIDS). *(The Hospital for Sick Children — Toronto, Ontario)*
- 2002** Discovery that fragile X syndrome (most common inherited cause of mental retardation) is related to glutamate in the brain. *(University Health Network — Toronto, Ontario)*
- 2002** Proof of efficacy of new treatment for HIV infection. *(University Health Network — Toronto, Ontario)*
- 2003** Performed the world's first hospital-to-hospital telerobotic assisted surgery on a patient more than 400 kilometres away. During the procedure, they completed a Nissen Fundoplication on a 66-year old patient located at North Bay General Hospital from St. Joseph's telerobotics suite in Hamilton, Ontario. *(St. Joseph's Healthcare — Hamilton, Ontario)*
- 2003** Discovery of a molecular marker to diagnose hepatocellular carcinoma (HCC), the most common type of liver cancer. HCC is usually asymptomatic at early stages, and has great propensity for invasion, making it difficult to treat. A test was developed for the early diagnosis of HCC, which could also be useful for the screening of individuals that are at high risk for developing this disease, such as people chronically infected with Hepatitis B and C. *(Sunnybrook & Women's Research Institute — Toronto, Ontario)*
- 2003** Researchers discover a way to make the immune system specifically recognize infectious prions, proteins that cause brain-wasting diseases like mad cow disease and Creutzfeldt - Jakob disease, its human equivalent. This discovery paves the way for the development of diagnostic tools, immunotherapy and a vaccine. *(Sunnybrook & Women's Research Institute — Toronto, Ontario)*
- 2003** Developed a genetically modified vaccine that can completely prevent the recurrence of metastatic breast cancer through genetically altered cells that only destroy cancer cells. *(Hamilton Health Sciences/McMaster University — Hamilton, Ontario)*
- 2003** Major international clinical trial provides first alternative treatment to taxol for preventing breast cancer recurrence in survivors five years post diagnosis. *(University Health Network — Toronto, Ontario)*
- 2003** Compilation of the complete DNA sequence of chromosome 7. Researchers decode nearly all of the genes on this medically important portion of the human genome. Chromosome 7 contains 1,455 genes, some of which, when altered, causes diseases such as cystic fibrosis, leukemia and autism. *(Hospital for Sick Children — Toronto, Ontario)*
- 2003** Found that the vast majority of heart attacks can be predicted by nine easily measurable factors that are the same in virtually every region and ethnic group worldwide. *(Hamilton Health Sciences/McMaster University — Hamilton, Ontario)*
- 2003** Study makes it easier to identify patients with deep vein thrombosis (DVT), providing faster diagnosis and significant savings to the healthcare system. *(Ottawa Health Research Institute — Ottawa, Ontario)*
- 2003** Performed the world's first deep brain stimulation for depression, causing previously treatment resistant depression to go into remission. *(University Health Network — Toronto, Ontario)*
- 2003** Identification of a cancer stem cell responsible for brain tumors. This discovery may change how this deadly condition is studied and treated in the future. *(Hospital for Sick Children — Toronto, Ontario)*
- 2003** Developed first draft DNA sequence for coronavirus implicated as cause of SARS *(Provincial Health Services Authority/BC Cancer Agency, Genome Sciences Centre — Vancouver, British Columbia)*

- 2003** Imaging scientists publish the first results to use digital mammography with a contrast agent (dye) to show tumors that cannot be viewed with current clinical mammography. (*Sunnybrook Health Sciences Centre — Toronto, Ontario*)
- 2003** Linkage of maternal folic acid intake to a decrease in neuroblastoma – a deadly childhood cancer. (*Hospital for Sick Children — Toronto, Ontario*)
- 2004** Development of StemBase, a database of gene expression data from DNA micro array experiments on samples from human and mouse stem cells and their derivatives. This growing resource is used to find genes whose activity is related to stem cells. (*Ottawa Health Research Institute — Ottawa, Ontario*)
- 2004** Discovery of the apelin receptor and designed an analogue that can interfere with and block the actions of apelin, in order to decipher its role in the brain. (*Centre for Addiction and Mental Health — Toronto, Ontario*)
- 2004** Performed the world's first simulated underwater surgery during the NASA Extreme Environment Mission Operation (NEEMO 7). During the 10-day NEEMO 7 Mission, they successfully telementored the NEEMO7 crew through various surgical simulations from their base in the underwater Aquarius habitat located 19 metres below the surface off the coast of Key Largo, Florida. (*St. Joseph's Healthcare – Hamilton, Ontario*)
- 2004** Discovery of over 70 novel human receptor genes; many of which, together with their chemical activators, mediate unique functions in the brain and are being targeted for drug design. (*Centre for Addiction and Mental Health — Toronto, Ontario*)
- 2004** Developed a virtual instrument that allows children with physical disabilities to make music (both therapeutic and recreational applications of the software – which is licensed in 7 countries around the world). (*Bloorview Kids Rehab — Toronto, Ontario*)
- 2004** In the first large, multi-centre clinical trial of its kind, researchers provided evidence to suggest that artery grafts from the forearm should be used in place of vein grafts from the leg in heart bypass surgery, because radial arteries have significantly higher graft patency over one year. Graft patency, a measure of whether the bypass remains open enough to permit efficient blood flow, is critical to success after surgery. (*Sunnybrook & Women's Research Institute — Toronto, Ontario*)
- 2004** A research team finds magnetic resonance imaging detects more breast cancer tumors, earlier, compared with mammography, ultrasound or clinical examination in women with the BRCA1 and BRCA2 genes. This finding offers hope for genetically at-risk women, for whom removal of both breasts is the only other option. (*Sunnybrook & Women's Research Institute — Toronto, Ontario*)
- 2004** World's first use beads of palladium, a low-dose radioactive material, to treat women with breast cancer as outpatients. This therapy holds the promise to eliminate anguishing side effects and enhance the quality of life of women considerably. (*Sunnybrook & Women's Research Institute — Toronto, Ontario*)
- 2004** Demonstration of an association between pediatric multiple sclerosis (MS) and the Epstein-Barr virus, indicating that exposure to the virus at a certain time in childhood may be an important environmental trigger for the development of MS. (*Hospital for Sick Children — Toronto, Ontario*)
- 2005** Initiation of first human clinical gene therapy trials for lipoprotein lipase deficiency. (*Provincial Health Services Authority/BC Children's Hospital — Vancouver, British Columbia*)
- 2005** In the first trial of its kind in the world, researchers begin treating prostate cancer using a 3-D image-guided radiation therapy device that was developed in Canada. This nonsurgical technique allows oncologists to visualize the exact position of the target and deliver precise external beam radiation therapy. (*Sunnybrook & Women's Research Institute — Toronto, Ontario*)
- 2005** Key discovery in Type-1 Diabetes proves the repair process present within the pancreas during disease development – understanding the repair process could be the key to treatment. (*Ottawa Health Research Institute — Ottawa, Ontario*)
- 2005** Developed the world's first upper respiratory viral panel test that can accurately identify all respiratory viruses including various flu strains including H5N1 and the SARS Coronavirus. (*St. Joseph's Healthcare — Hamilton, Ontario*)



- 2005** Study determines that a specific enzyme, known as pro-protein convertase 4 (PC4) may be responsible for fetal growth restriction, the second leading cause of infant mortality in the developed world. Knowledge may lead to screening for the defective enzyme early in the pregnancy and provide ability to monitor the pregnancy more closely. (*Ottawa Health Research Institute — Ottawa, Ontario*)
- 2005** Scientists show that early surgical removal of the spleen combined with antiangiogenic therapy, which arrests the growth of tumor-feeding blood vessels, may stop the progression of leukemia. (*Sunnybrook & Women's Research Institute — Toronto, Ontario*)
- 2005** Using neuropsychological testing, researchers accurately predict which study participants will develop Alzheimer's disease within five and ten years. Previous studies were able to predict Alzheimer's only for shorter periods of time; other studies showed predictions for ten and even fifteen years, but these did not indicate the predictive accuracy of the tests. (*Sunnybrook & Women's Research Institute — Toronto, Ontario*)
- 2005** Identified novel mutations in the gene that causes Rett Syndrome. The discovery is now licensed as a test for the disorder and is available to the public. (*Centre for Addiction and Mental Health — Toronto, Ontario*)
- 2006** First demonstration that dietary omega-3 fatty acid deficiency impairs neurogenesis in vivo (*Provincial Health Services Authority/BC Children's Hospital — Vancouver, British Columbia*)
- 2006** First demonstration that children with cystic fibrosis have choline deficiency. Provision of choline improves redox balance and methyl transfer capacity in humans. (*Provincial Health Services Authority/BC Children's Hospital — Vancouver, British Columbia*)
- 2006** Discovery of the precise molecular chain of events that initiates the wide-scale immune destruction of "super bug" infections such as flesh-eating disease, toxic shock syndrome and severe food poisoning. (*Robarts Research Institute — London, Ontario*)
- 2006** Implantation of an antibody-coated stent into the first human patient. The invention of the antibody-coated stent reduces complications and prevents blood clots from occurring. (*St. Michael's Hospital — Toronto, Ontario*)
- 2006** World's first clinical trial to combine gene and cell therapy to treat a cardiovascular disorder. The PHACeT (Pulmonary Hypertension: Assessment of Cell Therapy) trial will assess the use of adult stem-like cells called endothelial progenitor cells (EPC) for the treatment of pulmonary hypertension. (*St. Michael's Hospital — Toronto, Ontario*)
- 2006** First curative therapy for Huntington Disease in a mouse model (*Provincial Health Services Authority/BC Children's Hospital — Vancouver, British Columbia*)
- 2010** Discovery of a relationship between genetic mutations in the SHANK3 gene and schizophrenia. The SHANK3 gene which has also been associated with Autism. This indicates both a molecular relationship between the two disorders as well as potential genetic marker for Schizophrenia (*Hôpital Sainte-Justine — Université de Montréal*)

# Appendix C

## Select Spin-Off Companies Emerging From Canada's Academic Health Sciences Centres

Taken from "From Microscope to Marketplace...Spin-Off Companies from ACAHO Member Institutions" released by Association of Canadian Academic Healthcare Organizations in 2008 and based on available information to 2006. It is important to note that the scientists and clinicians who undertake research within ACAHO member institutions will have a cross appointment to their affiliated University.

1. **AB Biopharma (Calgary Health Region — Calgary, Alberta):** Founded in 2001, AB BioPharma is a nutraceutical company that develops products to help sufferers of gastrointestinal problems. The term "nutraceutical" refers to foods believed to have a medicinal effect on human health.
2. **AdapCS Canada Corporation (Kingston General Hospital — Kingston, Ontario):** Founded in 2003, AdapCS develops information technologies and services for the Canadian health care market that focus on current areas of concern, including clinical and financial outcomes, accountability and access. [www.adapcscanada.com](http://www.adapcscanada.com)
3. **Adherex Technologies Inc. (McGill University Health Centre Research Institute — Montreal, Quebec):** Founded in 1998, Adherex Technologies Inc. is a biopharmaceutical company dedicated to the discovery and development of novel cancer therapeutics. Adherex has multiple oncology products in the clinical stage of development. [www.adherex.com](http://www.adherex.com)
4. **Advanced Molecular Imagine (AMI) Inc. (Centre Hospitalier de Sherbrooke — Sherbrooke, Québec):** AMI was founded in 2004 to design, develop and manufacture next-generation imaging systems for both clinical and preclinical applications. The company invented MicroSPECT® and its XSPECT® system is the market leader in the small animal SPECT category. [www.advanced-mi.com](http://www.advanced-mi.com)
5. **Advitech (Les Produits Lactotech) (Hôpital Laval — Sainte-Foy, Québec):** Founded in 1995, Advitech is a nutraceutical company specializing in the development of new therapies for health conditions and diseases of the immune system. The term "nutraceutical" refers to foods believed to have a medicinal effect on human health. [www.advitech.com](http://www.advitech.com)
6. **Aegera Therapeutics (Children's Hospital of Eastern Ontario — Ottawa, Ontario):** Aegera Therapeutics, founded in 1995, is a clinical stage biotechnology company focused on developing drugs that control apoptosis (programmed cell death) to address major unmet medical needs. Lead programs are in development to induce apoptosis to kill cancer cells and to prevent apoptosis to save injured neuronal cells. [www.aegera.com](http://www.aegera.com)
7. **Affinity Biologicals Inc. (Hamilton Health Sciences/McMaster University — Hamilton, Ontario):** Founded in 1987, the company's initial focus was the production of reagents for research into disorders of thrombosis and hemostasis (blood clotting disorders). Products include affinity-purified antibodies, matched-pair antibody sets for ELISA, as well as a line of artificially prepared coagulation factor-deficient plasmas. [www.affinitybiologicals.com](http://www.affinitybiologicals.com)
8. **Affinium Pharmaceuticals (University Health Network — Toronto, Ontario):** Founded in 2002, Affinium is a pharmaceutical company focused on the clinical development of antibacterials (used to kill or prevent the growth of bacteria). Affinium's lead development program encompasses a potent, orally available, novel antibiotic class for the treatment of antibiotic resistant infections. [www.afnm.com](http://www.afnm.com)
9. **Amorfix (Sunnybrook Health Sciences Centre — Toronto, Ontario):** Founded in 2004, Amorfix is focused on the diagnosis and treatment of neurodegenerative diseases, where aggregated misfolded proteins (AMP) are prevalent. These include degenerative diseases such as Alzheimer's, Amyotrophic Lateral Sclerosis (ALS) and Parkinson's. [www.amorfix.com](http://www.amorfix.com)
10. **ARIUS Research (University Health Network — Toronto, Ontario):** Since its inception in 1999, ARIUS has been engaged in the research and development of novel anti-cancer monoclonal antibodies (antibodies that are identical because they were produced by one type of immune cell). ARIUS' proprietary FunctionFIRST™ technology platform uniquely creates functional anti-cancer monoclonal antibodies that belong to a class of revolutionary cancer drugs. [www.ariusresearch.com](http://www.ariusresearch.com)
11. **Aspreva Pharmaceuticals (Provincial Health Services Authority/Centre for Molecular Medicine and Therapeutics — Victoria, British Columbia):** Founded in 2003, Aspreva specializes in the search for innovative treatments for less common diseases through the identification, development, and commercialization of late-stage and approved medicines that show potential for high therapeutic impact. [www.aspreva.com](http://www.aspreva.com)

12. **Atamai Interactive Visualization** (Robarts Research Institute — London, Ontario): Founded in 2000, Atamai is specialized in real time three-dimensional medical image visualization. Atamai operates a growing repository of software components that can be modified and assembled quickly into functioning applications by those who prefer to focus on their problem domain rather than software engineering. The vast majority of this code base is available under a non-restrictive licence, making it attractive for academic environments to use and contribute code. [www.atamai.com](http://www.atamai.com)
13. **Atherochem Inc.** (Kingston General Hospital — Kingston, Ontario): AtheroChem Inc. is developing novel compounds for the treatment of coronary heart disease caused by atherosclerosis, an accumulation of fatty deposits within the artery walls. [www.atherochem.com](http://www.atherochem.com)
14. **BioAxone Therapeutic Inc.** (Centre Hospitalier de l'Université de Montréal — Montréal, Québec): BioAxone's strategy is to target the Rho factor protein in RNA transcription and Rho-related pathways with the purpose of developing drugs that meet large unmet medical needs. Rho is a signaling pathway which plays a key role in many disease indications. BioAxone was founded in 2000. [www.bioaxone.com](http://www.bioaxone.com)
15. **Biomark Imaging Inc.** (Robarts Research Institute — London, Ontario): Founded in 2004, Biomark Imaging Inc. specializes in imaging technology. Imaging technologies, which are varied in their application, can assist in diagnosing and treating conditions such as cardiovascular disease, asthma and mental illness. Imaging technologies are helping to better define clinical trials, and are even changing the way surgery is performed. More recently, imaging technologies are being used to bridge vast geographical expanses.
16. **Biomira Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): Biomira is a biotechnology company founded in 1985, specializing in the development of innovative therapeutic products for the treatment of cancer. Biomira's goal is to develop and commercialize novel synthetic vaccines and targeted small molecules that have the potential to improve the lives and outcomes of cancer patients. [www.biomira.com](http://www.biomira.com)
17. **BioMS Medical** (Capital Health / University of Alberta — Edmonton, Alberta): BioMS Medical is a biotechnology company engaged in the development and commercialization of novel therapeutic technologies with emphasis on the treatment of multiple sclerosis. BioMS was founded in 2000. [www.biomsmedical.com](http://www.biomsmedical.com)
18. **Biorthex Inc.** (Hôpital Sainte-Justine — Montréal, Québec): In 1994, Biorthex Inc. was established as a biotechnology company that designs, develops, manufactures and markets innovative and proprietary surgical products for the treatment of spinal disorders. The company is dedicated to providing the surgical community with safe, technologically proven and innovative spinal implants for use in the treatment of spinal disorders, diseases and injuries. ([www.biorthex.com](http://www.biorthex.com))
19. **Cangene** (Winnipeg Children's Hospital/University of Manitoba – Winnipeg, Manitoba): Cangene is a profitable and fully integrated developer and manufacturer of immune therapeutics, primarily targeting exigent infectious disease and biodefense applications. Its founders worked the Winnipeg Children's Hospital/University of Manitoba in the area of Rh disease. The company was founded in 1968.
20. **Cardiovascular Solutions Inc.** (Winnipeg Regional Health Authority — Winnipeg, Manitoba) CSI is developing and commercializing new treatments for restenosis – the blockage of arteries as a result of atherosclerosis. CSI has developed a proprietary product to coat stents which are used to prevent re-blockage of arteries. Successful pre-clinical trials in animal models are being used to prepare an application to be used in clinical trials.
21. **Cevena Bioproducts Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): Cevena is a science-based manufacturer and supplier of technologically superior oat and barley-based ingredients for the dietary supplement and functional food markets. Cevena was founded in 2002. [www.cevena.com](http://www.cevena.com)
22. **Chenomx Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): Chenomx offers a platform for generating, classifying and interpreting metabolic information obtained from biological fluids. Metabolic profiling allows researchers to link biochemicals to corresponding genes or proteins with relative ease. From these linkages, the detection and validation of potential drug targets can be accelerated. [www.chenomx.com](http://www.chenomx.com)
23. **Cognitive Sensing Inc.** (Université de Montréal/ Hôpital Sacré Coeur) Founded in 2009, Cognitive Sensing Inc is a spinoff company created from four patented technologies by the University of Montreal in collaboration with Univalor. CSI has the exclusive world wide license to develop, manufacture and market, these four scientifically proven products. The technologies are concerned with early and reliable neurobiological alterations and enhancing and training perceptual-cognitive performances in different populations and high-level athletes. Website. [www.cognitivesensing.com](http://www.cognitivesensing.com)

24. **Critical Outcome Technologies Inc.** (Robarts Research Institute — London, Ontario): Founded in 1996, Critical Outcome Technologies' mission is to apply computer technologies to profile, identify and optimize commercially viable drug candidates at the early stage of preclinical drug development and thereby dramatically reduce the time line and cost of getting new drugs to market. [www.criticaloutcome.com](http://www.criticaloutcome.com)
25. **CV Technologies** (Capital Health / University of Alberta — Edmonton, Alberta): Founded in 1992, CV Technologies develops and manufactures evidence-based natural health products for disease prevention and health maintenance. CV Technologies' most successful product is Cold-fX, a leading cold and flu product in Canada. CVT trades on the Toronto Stock Exchange. [www.cvtechnologies.com](http://www.cvtechnologies.com)
26. **Dementia Guide Inc.** (Capital District Health Authority — Halifax, Nova Scotia): Founded in 2000, Dementia Guide Inc. conducts research and development to create SymptomGuide, a tool to provide simple and comprehensive management of the symptoms of dementia. [www.dementiaguide.ca](http://www.dementiaguide.ca)
27. **Diabetogen Biosciences Inc.** (Robarts Research Institute — London, Ontario): Diabetogen is a biotechnology company that discovers and develops new drugs for autoimmune diseases (such as diabetes or lupus). Diabetogen's initial programs focus on the development of novel therapeutics for the treatment, prevention and cure of Type 1 (insulin-dependent) diabetes. [www.diabetogen.com](http://www.diabetogen.com)
28. **DNA Genotek** (The Ottawa Hospital): Founded in 2003, the DNA Genotek technology "Oragene•DNA" is the easiest, most reliable and cost-effective way to collect, transport, store and process large amounts of human DNA. Oragene•DNA is non-invasive, dependable, and easy-to-use. DNA Genotek markets its products worldwide and has established a global customer base, with more than 1,500 labs in 58 countries currently testing and using its products. [www.dnagenotek.com](http://www.dnagenotek.com)
29. **DriveABLE Assessment Centres Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): DriveABLE provides a scientifically based driving evaluation procedure to identify persons who have become unsafe to drive due to cognitive impairment. Its technology is internationally recognized and can be delivered on a worldwide basis. [www.driveable.com](http://www.driveable.com)
30. **Dynastream Innovations Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): Dynastream's patented SpeedMax technology is the platform on which several personal monitoring devices currently on the market are based. Dynastream is a developer and manufacturer of motion sensing and communication technologies to large companies worldwide. [www.dynastream.com](http://www.dynastream.com)
31. **Emerillon Therapeutics** (McGill University Health Centre Research Institute — Montreal, Quebec): Emerillon Therapeutics is a genomics-based drug discovery company founded in 2003, dedicated to the discovery of novel drug targets in complex human diseases. Emerillon is a spin-off of its parent company Xenon Pharmaceuticals. [www.emerillon.ca](http://www.emerillon.ca)
32. **GEMMA Biotechnology Ltd.** (University Health Network — Toronto, Ontario): GEMMA BioTechnology, founded in 1996, has developed an immune-boosting nutraceutical ingredient which could find a place in meal-replacement products and food supplements. The company's lead technology is Lactation-Associated ImmunoTrophic Protein (LAIT).
33. **GlycoDesign Inc.** (Mount Sinai Hospital — Toronto, Ontario): GLYCODesign is a world leader in the field of glycobiology (carbohydrate containing molecules and their role in the body). The company focuses on the discovery and early stage clinical development of novel glycotherapeutics for the treatment of cancer, cardiovascular diseases, inflammation and infectious diseases.
34. **Iaculor Injection Inc** (Centre Hospitalier Universitaire de Sherbrooke — Sherbrooke, Québec): Iaculor is focusing on the development and commercialization of new generation needlefree medical devices for the delivery of liquid or powder form drugs or vaccines. The company's shortterm goal is to complete the development of its medical devices and establish strategic partnerships for their production and commercialization.
35. **Innovotech** (University of Calgary — Calgary, Alberta): Founded in 1995, MBEC Biofilm Technologies was taken over by Innovotech, a product development company with three core businesses: contract research, commercial sale and product development. [www.innovotech.ca](http://www.innovotech.ca)
36. **Inseption Biosciences** (Mount Sinai Hospital — Toronto, Ontario): Founded in 1996, Inseption is the largest cord blood program in Canada, with more than 21,000 samples banked. The Inseption Cord Blood Program is able to provide every family with the ability to collect and store their baby's cord blood, while the company's biosciences division focuses on developing new and improved applications for stem cells. [www.biomsmedical.com](http://www.biomsmedical.com)

37. **ISM Biopolymer Inc.** (Centre Hospitalier Universitaire de Sherbrooke — Sherbrooke, Québec): ISM BioPolymer Inc. was founded in 1997. Its mission is to discover, develop and transform natural biopolymers (such as proteins and peptides, DNA, RNA, etc.) into unique, scientifically supported, high commercial-quality active ingredients that will improve human, animal and plant health in targeted indications. [www.ismbiopolymer.com](http://www.ismbiopolymer.com)
38. **Isotechnika Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): Isotechnika Inc. is an international biopharmaceutical company dedicated to the discovery, development and commercialization of novel immunosuppressive therapeutics (to reduce the activation or efficacy of the immune system) for the treatment of autoimmune diseases (e.g., Type 1 diabetes, lupus, rheumatoid arthritis) and for use in the prevention of organ rejection in transplantation. [www.isotechnika.com](http://www.isotechnika.com)
39. **Jennerex Biotherapeutics Inc.** (The Ottawa Hospital — Ottawa, Ontario): Founded in 2006, Jennerex Biotherapeutics Inc. is a development stage company working to discover, develop and commercialize novel oncolytic virotherapy products. Virotherapy is an experimental form of cancer treatment using biotechnology to convert viruses into cancer-fighting agents by reprogramming viruses to attack only cancerous cells, leaving healthy cells undamaged. The lead product candidate has completed one Phase I/II clinical trial and is currently in expanded Phase I/II clinical testing. The pipeline product candidates are completing preclinical evaluation and are expected to enter Phase I clinical trials in early 2007. [www.jennerex.com](http://www.jennerex.com)
40. **Kinexus** (Vancouver Coastal Health Authority — Vancouver, British Columbia): Founded in 1999, Kinexus is harnessing the powerful synergies of genomics, proteomics (the study of protein) and bioinformatics to understand cell signaling for the advancement of drug discovery, disease diagnosis, and global biomedical research. [www.kinexus.ca](http://www.kinexus.ca)
41. **KMT Hepatech Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): Founded in 2001, KMT Hepatech, Inc. provides collaborative research services to companies that are in preclinical development of hepatitis C therapeutics and vaccines, utilizing proprietary platform technology. [www.kmthepatech.com](http://www.kmthepatech.com)
42. **Life Imaging Systems Inc.** (London Health Sciences Centre — London, Ontario): The company began operations in 1995 to commercialize medical imaging technologies pioneered at the London Health Sciences Centre. Life Imaging Systems' primary focus is in developing three dimensional ultrasound imaging technologies to overcome the limitations of conventional two dimensional ultrasound imaging and increase ultrasound's overall clinical efficacy. [www.imaging.robarts.ca/irlspin.htm](http://www.imaging.robarts.ca/irlspin.htm)
43. **Liponex Inc.** (Ottawa Heart Institute — Ottawa, Ontario): Founded in 2000, Liponex is a biopharmaceutical company moving into Phase II trials with CRD5, its lead candidate. CRD5 raises High Density Lipoprotein (HDL), often called "good cholesterol." Novel HDL therapies, such as CRD5, are an area of significant interest for pharmaceutical companies worldwide. Liponex also has a broad pipeline of products with drug candidates in areas such as atherosclerosis, cancer and infectious disease. [www.liponex.ca](http://www.liponex.ca)
44. **LMS Medical Systems** (McGill University Health Centre Research Institute — Montreal, Quebec): LMS is a health care technology company founded in 1993 that develops innovative tools for obstetrical decision support, risk management and clinical information systems. LMS is a leader in the application of advanced mathematical modeling and neural networks for medical use. [www.lmsmedical.com](http://www.lmsmedical.com)
45. **LymphoSign Inc.** (The Hospital for Sick Children — Toronto, Ontario): LymphoSign Inc. is a private biopharmaceutical company developing drugs acting on signaling pathways involved in the progression of acute leukemias, lymphomas and solid tumours. LymphoSign is developing a number of novel compounds to inhibit abnormal cellular signaling specific to the growth of cancer cells. LymphoSign's lead drug candidate is nearing completion of preclinical testing and has shown great promise as a potential treatment of acute leukemias as well as other cancers. [www.lymphosign.com](http://www.lymphosign.com)
46. **MDS OCATA** (Mount Sinai Hospital — Toronto, Ontario): MDS Ocata Inc. is a new company using mass spectrometry to identify interacting proteins [www.mdsinc.com](http://www.mdsinc.com)
47. **Medicure Inc.** (Winnipeg Regional Health Authority — Winnipeg, Manitoba): Founded in 1997, Medicure Inc. is a publicly traded biotechnology company focused on becoming an internationally recognized leader in the development of therapies for unmet cardiovascular needs. [www.dfaitmaeci.gc.ca/canada-europa/france/espace/pdf/Medicure-ENG.pdf](http://www.dfaitmaeci.gc.ca/canada-europa/france/espace/pdf/Medicure-ENG.pdf)
48. **MedPharmGene Inc.** (Centre Hospitalier de l'Université de Montréal): Founded in 2001, MedPharmGene Inc is focused on clinical research in the fields of diabetes and hypertension. Current research aims to verify if more intensive management of blood pressure and glucose levels in diabetic patients is reducing the risk of major complications such as heart attack, stroke, blindness and kidney failure.



49. **Micralyne Inc** (Capital Health / University of Alberta — Edmonton, Alberta): With core competencies in micromachining, thin film deposition, and micro-electromechanical systems assembly and test capabilities, Micralyne develops and manufactures devices for the communications, energy, life sciences, and transportation markets. Micralyne was founded in 1982. [www.micralyne.com](http://www.micralyne.com)
50. **MIGENIX** (Vancouver Coastal Health Authority — Vancouver, British Columbia): MIGENIX is focused on the development of drugs to treat or prevent infectious, degenerative and metabolic diseases or disorders. MIGENIX was founded in 1988. [www.migenix.com](http://www.migenix.com)
51. **MJ Laboratory Services Limited** (Hamilton Health Sciences/McMaster University — Hamilton, Ontario): Established in 1990, the company offers a complete range of testing for clinical trials, research projects and product evaluation to pharmaceutical companies, diagnostic manufacturers and researchers. Areas of expertise include the measurement of routine and esoteric hemostasis testing, cytokine testing and DNA analysis. [www.hemostasislab.com](http://www.hemostasislab.com)
52. **Molecular Templates Inc.** (University Health Network — Toronto, Ontario): Founded in 2000, Molecular Templates Inc. aims to advance the preclinical and clinical development of novel treatments for melanoma, prostate and other cancers and move rapidly into clinical trials. [www.moleculartemplates.com/home.htm](http://www.moleculartemplates.com/home.htm)
53. **MOXXI Medical Inc.** (McGill University Health Centre Research Institute — Montreal, Quebec): Founded in 2003, MOXXI Medical is an integrated delivery system for prescription drug management for physicians, pharmacists, payers and their respective patients. MOXXI Medical will commercialize an electronic prescription and drug-tracking transaction-based solution that directly links physicians prescribing medications, pharmacists fulfilling the prescriptions, and payers (public and private). [www.moxximedical.com](http://www.moxximedical.com)
54. **NAEJA Pharmaceuticals Inc.** (Capital Health / University of Alberta — Edmonton, Alberta): NAEJA specializes in preclinical drug discovery and contract research in multiple therapeutic areas. NAEJA employs scientific researchers with expertise in all aspects of drug development, including lead optimization, biopharmaceutical profiling, microbiology and custom synthesis. [www.naeja.com](http://www.naeja.com)
55. **Neptune Technologies and Bioresources Inc.** (Centre Hospitalier Universitaire de Sherbrooke — Sherbrooke, Québec): Neptune Technologies and Bioresources Inc. extracts, scientifically validates, and markets natural health products from marine biomasses and currently provides the world's only FDA-approved oil from krill. [www.neptunebiotech.com](http://www.neptunebiotech.com)
56. **Neurochem Inc.** (Kingston General Hospital — Kingston, Ontario): Neurochem is a publicly traded pharmaceutical company with product candidates in clinical development for amyloid-related diseases and disorders of the central nervous system (such as Huntington's disease, Parkinson's disease, etc). Neurochem was founded in 1994. [www.neurochem.com](http://www.neurochem.com)
57. **Neuromed Pharmaceuticals** (Vancouver Coastal Health — Vancouver, British Columbia): Formed in 1998, Neuromed Pharmaceuticals develops drugs to target chronic pain, including neuropathic pain and inflammatory conditions such as arthritis. In March 2006, Neuromed and Merck & Co. signed a research collaboration and licence agreement to research, develop and commercialize novel compounds for the treatment of pain and other neurological disorders, including Neuromed's lead compound NMED-160 for the treatment of pain, which is currently in Phase 2 development. [www.neuromed.com](http://www.neuromed.com)
58. **NovaNeuron** (Capital District Health Authority — Halifax, Nova Scotia): By studying Huntington's disease (HD) mouse models and post-mortem brains of HD patients, NovaNeuron scientists discovered a drug target for HD. Research is ongoing to demonstrate the link between this target and the pathogenesis of HD.
59. **OncoGeneX** (Vancouver Coastal Health — Vancouver, British Columbia): Founded in 2000, OncoGeneX is a biopharmaceutical company committed to the development and commercialization of new cancer therapies that address treatment resistance in cancer patients. OncoGeneX currently has three product candidates in development. These product candidates are designed to selectively inhibit the production of proteins that are associated with treatment resistance and that are over-produced in response to a variety of cancer treatments. [www.oncogenex.ca](http://www.oncogenex.ca)
60. **Oncolytics Biotech Inc.** (Calgary Health Region — Calgary, Alberta): Founded in 1998, Oncolytics is a Calgary-based biotechnology company focused on the development of oncolytic viruses as potential cancer therapeutics. Oncolytics' clinical program includes a variety of Phase I and Phase I/II human trials. [www.oncolyticsbiotech.com](http://www.oncolyticsbiotech.com)

61. **Osteokine Inc.**(Hamilton Health Sciences/McMaster University – Hamilton, Ontario): Osteokine Inc. is a small biotechnology company that has as its main focus the development of novel therapeutics for the treatment and prevention of postmenopausal bone loss. Osteokine investigators have made exciting observations in animal models, enabling the identification of the molecular mechanisms responsible for bone loss leading to the development of specific agents to reverse these mechanisms.
62. **Plantigen Inc.** (London Health Sciences Centre — London, Ontario): Plantigen Inc. is a novel therapeutics discovery company focused on the identification and development of biopharmaceuticals in genetically enhanced plants to prevent and treat disease. [www.lhsc.on.ca/plantigen](http://www.lhsc.on.ca/plantigen)
63. **Prognomix Inc.** (Centre Hospitalier de l'Université de Montréal) : Founded in 2006, Prognomix aims to develop new prognostic genomic biomarkers for the early identification of subset of type 2 diabetes patients at risk of developing renal, cardiovascular, nervous or ocular complications.
64. **Quillsoft Ltd** (Bloorview Kids Rehab – Toronto, Ontario): Founded in 2000, Quillsoft manufactures and distributes specialized writing software (WordQ and SpeakQ software) for individuals with learning disabilities. Distribution includes Canada, USA, UK, Germany, Australia and New Zealand. WordQ is available in English, French, German, and Spanish. There are currently more than 100,000 WordQ users, with gross revenues in excess of \$1.5 million. [www.wordq.com](http://www.wordq.com)
65. **Resonant Medical** (McGill University Health Centre Research Institute — Montreal, Quebec): A privately-held company founded in 2000 by industry experts, Resonant Medical develops, manufactures and commercializes 3-D ultrasound image-guided adaptive radiotherapy products. Radiotherapy is the use of radiation as part of cancer treatment to control malignant cells. The goal is to help cancer centres make significant improvements in radiation therapy planning, verification and delivery in order to advance patient care. [www.resonantmedical.com](http://www.resonantmedical.com)
66. **Resverlogix Corp.** (Calgary Health Region — Calgary, Alberta): Resverlogix Corp. is a publicly traded biotechnology company focused on groundbreaking research in the areas of cardiovascular disease, cancer, and fibrotic diseases. Resverlogix was founded in 2003. [www.resverlogix.com](http://www.resverlogix.com)
67. **Saga Tech Electronics Inc.** (Calgary Health Region — Calgary, Alberta): SagaTech focuses on creating innovative medical devices for the diagnosis and management of sleep apnea. SagaTech develops and manufactures convenient, scientifically valid devices that provide cost-effective solutions to diagnostic and therapeutic challenges in the field of sleep-disordered breathing. [www.sagatech.ca](http://www.sagatech.ca)
68. **Sembiosys** (Calgary Health Region — Calgary, Alberta): Sembiosys develops products using its proprietary oilbody-oleosin technology to treat cardiovascular and metabolic diseases, while harvesting the investments that have been made in non-pharmaceutical products. Sembiosys employs nearly 50 researchers in its Calgary headquarters. [www.sembiosys.com](http://www.sembiosys.com)
69. **Sentinel Medical** (Sunnybrook Health Sciences Centre — Toronto, Ontario): Sentinel Medical, which has grown out of leading-edge research at Sunnybrook and Women's Health Sciences Centre, is dedicated to furthering breast MRI and interventional technology. [www.sentinelmedical.com](http://www.sentinelmedical.com)
70. **Sirius Genomics** (Vancouver Coastal Health — Vancouver, British Columbia): Sirius Genomics is a life sciences company that uses pharmacogenomics in the research, development and commercialization of genetic-based diagnostic products for the treatment of critical illnesses and severe infections. The company identifies important genetic variations in the biological pathways that are important in critical illness and severe infection and then uses this information to select the appropriate treatment for each patient. These discoveries will make possible dramatic improvements in the design and results of the efficacy of clinical trials and clinical care through the selection of appropriate patients. [www.siriusgenomics.com](http://www.siriusgenomics.com)
71. **Solution YD3** (Centre Hospitalier de l'Université de Montréal): Founded in 1999, YD3 is commercializing a 3D evaluation tool of knee kinematics comprised of a harness and data analysis software. The method provides quantitative data for the 3 main knee movements. Real-time data is obtained by harnessing sensors to the knee thus producing the personalized signature of the patient's knee (BIOKNEETM).
72. **Spectral Diagnostics** (University Health Network — Toronto, Ontario): Spectral is a developer of innovative technologies for comprehensive disease management. It provides accurate and timely information to clinicians enabling the early initiation of appropriate and targeted therapy. [www.spectraldx.com](http://www.spectraldx.com)
73. **Stem Cell Therapeutics** (Calgary Health Region — Calgary, Alberta): Stem Cell Therapies is developing a pipeline of CNS-regenerative drugs to treat traumatic brain injury. [www.stemcellthera.com](http://www.stemcellthera.com)

74. **Stempath Inc.** (The Ottawa Hospital — Ottawa, Ontario): Founded in 2002, Stempath Inc. aims to become the first pharmaceutical company specializing in therapeutic solutions that modulate the body's natural regenerative capacity. Currently at the discovery stage, StemPath is engaged in in vivo proof-of-concept experiments and anticipates entering into preclinical testing by early 2007. [www.stempath.com](http://www.stempath.com)
75. **Strida Pharma Inc.** (McGill University Health Centre Research Institute — Montreal, Quebec): Strida Pharma Inc. is a biopharmaceutical company dedicated to improving the survival and quality of life of cancer patients by developing targeted therapeutics focused on a proprietary strategic anti-cancer target. Strida Pharma Inc was founded in 2002. [www.stridapharma.com](http://www.stridapharma.com)
76. **Topigen Pharmaceuticals Inc** (Centre Hospitalier de l'Université de Montréal): Founded in 2005, Topigen is developing several new classes of drugs and is actively progressing two drug candidates in Phase II trials for Chronic Obstructive Pulmonary Disease and asthma. These drugs are uniquely focused on inhibiting multiple inflammation targets underlying chronic pulmonary diseases. [www.topigen.com](http://www.topigen.com)
77. **Transition Therapeutics Inc** (Mount Sinai Hospital — Toronto, Ontario): Founded in 1998, Transition Therapeutics is a fully integrated biopharmaceutical company with a proprietary state-of the art drug discovery engine and extensive drug development program exploring novel therapeutics in multiple disease indications. [www.transitiontherapeutics.com](http://www.transitiontherapeutics.com)
78. **TrialStat** (Children's Hospital of Eastern Ontario — Ottawa, Ontario): TriatStat is an Ottawa based technology and services company, founded in 2002, providing powerful, cost-effective turn-key data capture and management tools for researchers and investigators in health care. TrialStat provides proven, industrial-strength data management software solutions to the clinical research community. Focused specifically on clinical trials, systematic reviews and patient registries, TrialStat's comprehensive, intuitive products are helping hundreds of clinicians to manage their data and their entire studies efficiently, securely and cost effectively. [www.trialstat.com](http://www.trialstat.com)
79. **Trillium Technologies** (Robarts Research Institute — London, Ontario): Founded in 1996, Trillium Technologies is a research-driven biopharmaceutical company with a strong immunology focus, specializing in the discovery and development of innovative therapies for the treatment of immune-mediated disorders. The company's therapeutic approaches are aimed at restoring balance to the immune system in conditions associated with aberrant and harmful immune responses, such as autoimmune and inflammatory disorders, graft rejection, cancer and chronic viral diseases. [www.trilliumtherapeutics.com](http://www.trilliumtherapeutics.com)
80. **Unleashed Informatics Ltd.** (Mount Sinai Hospital — Toronto, Ontario): Founded in 2004, Unleashed Informatics is targeted to the general life sciences market, including biotechnology and pharmaceutical firms, with a focus on bioinformatics, genomics, proteomics, and cheminformatics applications. [www.unleashedinformatics.com](http://www.unleashedinformatics.com)
81. **Variation Biotechnologies Inc.** (Children's Hospital of Eastern Ontario — Ottawa, Ontario): Variation Biotechnologies Inc. was founded in 2001 to commercialize pioneering research in the bioinformatic design of vaccines. Variosite technology addresses the issue of "antigenic variation," which allows viral pathogens to escape detection .by the human immune system; the technology can be applied to viruses such as HIV, hepatitis C, influenza, SARS and dengue. In 2006, Variation was named one of the top 10 life science companies in Canada. [www.variationbiotech.com](http://www.variationbiotech.com)
82. **Vascular Therapeutics Incorporated** (Hamilton Health Sciences/McMaster University — Hamilton, Ontario): Since acquired by Glycodesign in 1999, Vascular Therapeutics Incorporated (VTI) was funded to the level of one million USD per year, in return for 10 years of first rights of refusal of discoveries in the treatment of thrombosis. [www.hemostasislab.com](http://www.hemostasislab.com)
83. **ViRexx** (Capital Health / University of Alberta — Edmonton, Alberta): ViRexx is an Edmonton, Alberta-based biotechnology company focused on the development of novel therapeutic products for the treatment of cancer and chronic viral infections. ViRexx's most advanced clinical programs include drug candidates for the treatment of ovarian cancer, chronic hepatitis B&C and solid tumours. [www.virexx.com](http://www.virexx.com)
84. **Viron Therapeutics Inc.** (Robarts Research Institute — London, Ontario): Founded in 1997, Viron Therapeutics Inc. is a biopharmaceutical company dedicated to becoming a market leader in the treatment of inflammatory disorders. By harnessing the evolutionary power of viruses that have evolved over millennia, the company is developing powerful protein therapeutics that will block the human body's inflammatory attack. [www.vironinc.com](http://www.vironinc.com)
85. **VisualSonics Inc.** (Sunnybrook Health Sciences Centre — Toronto, Ontario): VisualSonics is the leading developer of high-resolution, in-vivo micro-imaging systems devised specifically for noninvasive, small animal research. High-resolution imaging allows the small animal researcher to derive results in ways that were previously possible to imagine, but extremely difficult to achieve. [www.visualsonics.com](http://www.visualsonics.com)



86. **World Heart Corporation** (The Ottawa Hospital — Ottawa, Ontario): Founded in 1996, World Heart is a global technology leader in mechanical circulatory support systems. World Heart provides long-term mechanical circulatory support to the population of heart failure patients. World Heart is developing both pulsatile ventricular assist devices (VADs), which mimic the action of the natural heart, as well as the continuous flow rotary VAD, which is smaller and more easily implanted. [www.worldheart.com](http://www.worldheart.com)
87. **Xenon Pharmaceuticals** (Vancouver Coastal Health Authority/Provincial Health Services Authority – Vancouver, British Columbia): Xenon is a privately held company located in Vancouver with just over 70 employees. Xenon is a leader in clinical genetic-based drug discovery and development and has built a worldwide network of over 40 clinical collaborators to find and access the rare families with diseases of relevance to drug discovery. [www.xenon-pharma.com](http://www.xenon-pharma.com)
88. **Xillix Technologies** (Provincial Health Services Authority — Vancouver, British Columbia): Founded in 1988, Xillix focuses on the research, development and commercialization of medical imaging technologies which aid in the early detection and localization of cancer. [www.xillix.com](http://www.xillix.com)
89. **XLR Imaging** (Robarts Research Institute — London, Ontario): Founded in 2003, XLR develops and manufactures MRI imaging products and solutions. [www.xlr imaging.com](http://www.xlr imaging.com)

# Appendix D

## Overview of Provincial/Territorial Ministerial Responsibility for AHSC Tripartite Mission and Mandate

Ministry, Department or Related Government Agency or Council					
PROVINCE	HEALTH CARE DELIVERY	POST-SECONDARY EDUCATION	RESEARCH, INNOVATION AND RELATED	HEALTH PROMOTION AND RELATED	OTHER
BC	Health Services	Advanced Education and Labour Market Development	Innovation Council Small Business, a Economic Development	Healthy Living and Sport	Children and Family Development
AB	Health and Wellness	Advanced Education and Technology	Advanced Education and Technology		Children and Youth Services
SK	Health	Advanced Education, Employment and Labour	Health Research Foundation Research Council (Crown Corp)		Social Services Health Quality Council
MB	Health	Advanced Education and Literacy	Science Technology, Energy and Mines	Healthy Living Health Research Council	Family Services and Housing
ON	Health and Long-Term Care	Training, Colleges & Universities	Research and Innovation	Health Promotion	Children and Youth Services Community and Social Services
QC	Sante et Services sociaux	Education, Loisir et Sport	Société de Innovatech Québec	FRSQ	Famille et Aines
NB	Health	Post-Secondary Education Training and Labour	Innovation Foundation		Social Development
PEI	Health	Innovation and Advanced Learning	Innovation and Advanced Learning		Social Services and Seniors
NS	Health	Education	Innovo Corp (Agency of Government)	Health Promotion and Protection	Community Services
NFLD	Health and Community Services	Education	Innovation, Trade and Rural Development		
YK	Health and Social Services	Education			Community Services
NWT	Health and Social Services	Education, culture and employment			
Nunavut	Health and Social Services	Education			Culture, Language, Elders and Youth

## Select Bibliography

Academic Medical Centre Research Team. *Key Trends in Academic Medical Centres: Preview of Advisory Board AMC Executive Forum*; The Advisory Board / May 15, 2008.

Academic Medicine. *Towards a Virtuous Cycle: The Changing Face of Academic Health Centres*, September 2008.

Anderson G, Steinberg E, Heyssel R. *The Pivotal Role of the Academic Health Centre*; Health Affairs / Summer 1994.

Association of American Medical Colleges. *The Economic Impact of AAMC-Member Medical Schools and Teaching Hospitals*. September 2009.

Association of Canadian Academic Healthcare Organizations. *Moving at the Speed of Discovery – From Bench to Bedside to Business*. Ottawa ON: Association of Canadian Academic Healthcare Organizations. 2007.

Association of Canadian Academic Health Care Organizations. *EUREKA! World's First Discoveries and Other Major Medical Breakthroughs in ACAHO Member Institutions*. Ottawa ON: Association of Canadian Academic Health Care Organizations. 2008.

Association of Canadian Academic Healthcare Organizations. *From Microscope to Marketplace: Spin-Off Companies from ACAHO Member Institutions*. Ottawa ON: Association of Canadian Academic Healthcare Organizations. 2008.

Association of Canadian Faculties of Medicine. (2008). *Canadian Medical Education Statistics*. Ottawa, Ontario: Association of Canadian Faculties of Medicine.

Association of Canadian Medical Colleges of Canada/Association of Canadian Teaching Hospitals Committee on Academic Health Sciences Centres. *Together in the Academic Health Sciences Centre: Renewing the Partnership* (Rowand RS and Sinclair DG, principal authors). ACMC Forum, 1994; 28:1-8.

Balser JR, Baruchin A. *Science at the Interstices: An Evolution in the Academy*; Academic Medicine, Vol. 83, No. 9, September 2008.

Barrett DJ. *The Evolving Organizational Structure of Academic Health Centers: The Case of the University of Florida*; Academic Medicine, Vol. 83, No. 9, September 2008.

Bernstein A. *AHSCs: More Important Than Ever in the Century of Research*; Healthcare Papers; Vol. 2, No. 3, 2002.

Blackburn & Associates. *Securing the Future of Canada's Academic Health Sciences Centres – Environmental Scan Report*. 2009. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org).

Blue Ridge Academic Health Group; *Health Care Quality and Safety in the Academic Health Center*; Report 11, October 2007.

Brimacombe GG. *Securing the Future of Canada's Academic Health Sciences Centres*; Healthcare Quarterly Vol. 7 No. 4, 2004.

Coleman DL. *Establishing Policies for the Relationship Between Industry and Clinicians: Lessons Learned From Two Academic Health Centers*; Academic Medicine, Vol. 83, No. 9, September 2008.

Commonwealth Fund. *Envisioning the Future of Academic Health Centres: Final Report of The Commonwealth Fund Task Force on Academic Health Centers*; February 2003.

Cooke, M et. al. (2006), *American Medical Education 100 Years after the Flexner Report*, New England Journal of Medicine, 355: 1339-1344, Sept. 28, 2006.

Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres in Canada – A Case Study Describing the Current State and Future Issues. Final Report, September 2009*. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org).

Council of Academic Hospitals of Ontario. *Exploring the Contributions of Academic Hospitals in a Changing Health Care Environment – A CAHO Discussion Paper*. February 2006.

Culbertson R. *A U.S. Perspective: A Future of Increased Diversification*; Healthcare Papers Vol. 2, No. 3, 2002.

Davies S. *Identity and Ideology: A Comparative Study of Academic Health Organisations in the UK and the USA*; The Nuffield Trust, 2002.

Davies DS. *Academic Health Centres: What is the Agenda for Research?*; J Health Serv Res Policy Vol 13 No 1, January 2008.

Deloitte. *Academic Health Sciences Centres – The Tipping Point. Building Sustainable Strategies for the Future*. 2009.

Deloitte. *Academic Medical Centers: The Tipping Point. Building Sustainable Strategies for the Future*. 2009.

Dzau VJ, Ackerly DC, Sutton-Wallace P, Merson MH, Williams RS, Krishnan KR, Taber RC, Califf RM. *The Role of Academic Health Science Systems in the Transformation of Medicine*. Lancet, Vol. 375, March 13, 2010.

Federal, Provincial and Territorial Ministers of Health. *Fulfilling the Mission – National Conference on the Future and Funding of Academic Health Science Centers*. Sponsored by the Province of Ontario, December, 1995.

Flexner A. *Medical Education in the United States and Canada*. The Carnegie Foundation, 1910.

Fyffe DW, Srigley JR. *Solutions Must Include the Community Hospitals*; Healthcare Papers Vol. 2, No. 3, 2002.

Geyer L, Topp A. *Sources of Variation in Hospital Cost Per Weighted Case*. Toronto, Ontario: Adjustment Factors Cost Subgroup, Joint Policy and Planning Committee.

Hay Group. *Understanding the Differences Between Academic Health Science Centres and Community Hospitals*. April, 2002.

Hay Group. *The Cost Impact of the Academic Mission of Teaching Hospitals - A Review of the Literature*. March, 2005.

Institute of Medicine. *Academic Health Centres: Leading Change in the 21st Century*; National Academies Press, July 2003.

Joiner KA, Libecap A, March AEC, Wormsley S, St. Germain P, Berg R, Malan P. *Supporting the Academic Mission in an Era of Constrained Resources: Approaches at the University of Arizona College of Medicine*; Academic Medicine, Vol. 83, No. 9, September 2008.

Levine AS, Detre TP, McDonald MC, Roth LH, Huber GA, Brignano MG, MA, Danoff SN, Farner DM, Masnick JL, Romoff JA. *The Relationship Between the University of Pittsburgh School of Medicine and the University of Pittsburgh Medical Center—A Profile in Synergy*; Academic Medicine, Vol. 83, No. 9, September 2008.

Linna M., Hakkinen U., Linnakko E. *An Econometric Study of Costs of Teaching and Research in Finnish Hospitals*. *Health Economics*. 7:291-305 (1998).

Lozon JC, Fox RM. *Academic Health Centres Laid Bare*; Healthcare Papers Vol. 2, No. 3, 2002.

Ludmerer KM. *The Embattled Academic Health Centre*; Healthcare Papers Vol. 2, No. 3, 2002.

MacLellan K. *Begin With Ethics. The Rest Will Follow*; Healthcare Papers Vol. 2, No. 3, 2002.

McNally, N. *The Potential Impact of Academic Health Science Centres in the UK and Abroad*.

Moses H, Their S, Matheson D. *Why Have Academic Medical Centers Survived?* JAMA, 2005; 293: 1495-1500.

Phillips SE, Rubenstein AH. *The Changing Relationships Between Academic Health Centers and Their Universities: A Look at the University of Pennsylvania*; Academic Medicine, Vol. 83, No. 9, September 2008.

Pizzo PA. *The Stanford University School of Medicine and Its Teaching Hospitals*; Academic Medicine, Vol. 83, No. 9, September 2008.

Pomeroy C, Rice A, McGowan W, Osburn N. *Linking Academic and Clinical Missions: UC Davis' Integrated AHC*; Academic Medicine, Vol. 83, No. 9, September 2008.

Ontario Provincial Coordinating Committee on Community and Academic Health Science Centre Relations, Ministry of Health & Long-Term Care, Ontario, 1995.

- Ramsey PG, Miller ED. *A Single Mission for Academic Medicine: Improving Health*; *Journal of the American Medical Association*, Vol. 301, Issue 14, April 8, 2009.
- Sanfilippo F, Bendapudi N, Rucci A, Schlesinger L. *Strong Leadership and Teamwork Drive Culture and Performance Change: Ohio State University Medical Center 2000–2006*; *Academic Medicine*, Vol. 83, No. 9, September 2008.
- Schneller ES. *The Movement from Brokers of Scarce Resources to Victims of the Changing Environment of Healthcare Delivery*; *Healthcare Papers* Vol. 2, No. 3, 2002.
- Shugart I. *An Indispensable Partner for Governments*; *Healthcare Papers* Vol. 2, No. 3, 2002.
- Smith ER. *Academic Health Science Centres: A View from the Academy*; *Healthcare Papers* Vol. 2, No. 3, 2002.
- Smith J, Smith R. . *The Future of Academic Medicine: Five Scenarios to 2025*. [www.milbank.org/reports/0507FiveFutures/0507FiveFutures.html](http://www.milbank.org/reports/0507FiveFutures/0507FiveFutures.html) , 1-31.
- Sorensen AA. *The Transformation of Research in the Health Professions at the University of South Carolina*; *Academic Medicine*, Vol. 83, No. 9, September 2008.
- Standing Senate Committee on Social Affairs, *Science and Technology*. Volume Six: *Recommendations for Reform, The Health of Canadians – The Federal Role, Final Report on the state of the health care system in Canada*; The Senate of Canada, October 2002.
- Tepper JD. *The Disconnect of Twin Pillars: The Growing Rift in Educational Goals and Methods between Medical Schools and the Academic Teaching Hospitals*; *Healthcare Papers* Vol. 2, No. 3, 2002.
- Topps M, Strasser R. *When a Community Hospital Becomes an Academic Health Science Centre*; *Canadian Journal of Rural Medicine*, Vol. 15, Issue 1, 2010.
- Valberg LS, Meredith MD, Gonyea A, Sinclair DG, Wade J. *Planning the Future Academic Medical Centre: Conceptual Framework and Financial Design*; The Canadian Medical Association, 1994.
- Ward TF. *Governments, Policy Directions and the Future of Academic Health Science Centres*; *Healthcare Papers* Vol. 2, No. 3, 2002.
- Wartman SA. *Toward a Virtuous Cycle: The Changing Face of Academic Health Centers*; *Academic Medicine*, Vol. 83, No. 9, September 2008.
- Whitcomb ME. *The Future of Academic Health Centers*; *Academic Medicine*, Vol. 81, No. 4, April 2006.
- Wilson MR, Krugman RD. *The Changing Face of Academic Health Centers: A Path Forward for the University of Colorado Denver*; *Academic Medicine*, Vol. 83, No. 9, September 2008.
- Woollard R. *AHSCs: the Complex Simplicity of Service*; *Healthcare Papers* Vol. 2, No. 3, 2002.

## End Notes

- 1 Naylor, C. D. (1999). *Health Care in Canada: Incrementalism Under Fiscal Duress*. Health Affairs (Millwood) 18(3): 9-26.
- 2 A variety of arrangements exist that bring colleges and other advanced educational institutes into the collective academic health sciences enterprise. For example, colleges and other institutes may be the exclusive educator for some technical and paraprofessional health workers (e.g., Registered Practical Nurses, Pharmacy Technicians); in some cases both universities and colleges educate health providers (e.g., laboratory technologists); or in collaboration with the university being the degree grantor (e.g. registered nurses); and finally, there are still a few examples of independent, specialized educational institutes such as the Canadian Colleges which educate chiropractors and naturopaths.
- 3 Baker P. *Harnessing the AHSC Partnership*. Figure is based on a presentation by Dr. Philip Baker (Dean, Faculty of Medicine & Dentistry, University of Alberta) at the AHSC National Symposium, January 29, 2010.
- 4 Dagnone T. *Patients First Review*. Saskatchewan Patient First Review Commissioner. October 2009. Standing Senate Committee on Social Affairs, Science and Technology. *The Health of Canadians – The Federal Role. Volume Six: Recommendations for Reform*. October 2002. Romanow R. *Building on Values – The Future of Health Care in Canada. Final Report*. November 2002. Clair M. *Emerging Solutions*. January 2001. Fyke K. *Caring for Medicare – Sustaining A Quality System. Commission on Medicare*. April 2001. The Ontario Health Services Restructuring Commission. *Looking Back, Looking Forward, 1996-2000 – A Legacy Report*. Government of Ontario. National Forum on Health. *Canada Health Action: Building on the Legacy, Volume I: Final Report*. February 1997.
- 5 Such as *funding* (including: public vs. private roles; federal, provincial and territorial responsibilities). They have also addressed the *structural* requirements of the system (including: accessibility and system performance; regionalization; accountability and integration; health human resources; primary (health) care reform; home care; pharmaceutical management; diffusion of medical technologies/equipment; technology assessment; capital/physical infrastructure; quality of care and patient safety; and research and innovation.
- 6 Of note, there are two important reports in the Canadian context that have specifically focused on the role of Academic Health Sciences Centres: (1) Valberg LS, Meredith MD, Gonyea A, Sinclair DG, Wade J. *Planning the Future Academic Medical Centre: Conceptual Framework and Financial Design*; The Canadian Medical Association, 1994; and (2) Federal, Provincial and Territorial Ministers of Health. *Fulfilling the Mission – National Conference on the Future and Funding of Academic Health Science Centers*. Sponsored by the Province of Ontario, December, 1995.
- 7 Blackburn & Associates. *Securing the Future of Canada’s Academic Health Sciences Centres – Environmental Scan Report*. 2009. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org).
- 8 Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres in Canada – A Case Study Describing the Current State and Future Issues. Final Report, September 2009*. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org).
- 9 Proceedings of the National Symposium will be available on the AHSC web-site in the near future at [www.ahsc-ntf.org](http://www.ahsc-ntf.org).
- 10 Ludmerer, KM (2002). *The Embattled Academic Health Centre*. Healthcare Papers (Longwoods) 2(3): 59-65.
- 11 Flexner A. *Medical Education in the United States and Canada*. The Carnegie Foundation, 1910. Cooke, M et. al. (2006), American Medical Education 100 Years after the Flexner Report, New England Journal of Medicine, 355: 1339-1344, Sept. 28, 2006.
- 12 Cooke, M et. al. (2006), American Medical Education 100 Years after the Flexner Report, New England Journal of Medicine, 355: 1339-1344, Sept. 28, 2006.
- 13 Other developed countries have chosen different terms to define the AHSC. For example, in the United States they are often defined as being an “Academic Health Center”, in the United Kingdom, an “Academic Medical Center”, and in the Netherlands they are referred to as a “University Medical Centre”.

- 14 The history of the modern AHSC can be traced back 120 years to 1889 when Johns Hopkins Hospital opened its doors as one of the first, if not the first, hospital in the United States that allowed medical students to work as clinical clerks and receive part of their training at the bedside, with medical research conducted within the hospital setting. Other large hospitals followed the Hopkins lead over the next 20-30 years. This led to more frequent and active educational partnerships with medical schools and by the 1920s the modern teaching hospital was finally created. From the beginning, the relationship between medical schools and teaching hospitals was one of *co-dependency*. Medical schools, ever on the alert for clinical facilities, understood that access to the wards of hospitals was essential for teaching and research. Teaching hospitals, in turn, understood that their pre-eminence in 20th-century medical practice was a direct consequence of their participation in medical education.
- 15 Lozon, JC and RM Fox (2002). *Academic Health Sciences Centres Laid Bare. Lead Paper*, Healthcare Papers (Longwoods) 2(3): 10-36
- 16 Depending on the province in question, the governance of health institutions and their relationship with a university would be different. For example, in British Columbia (University of British Columbia), it would be the Provincial Health Services Authority, Vancouver Coastal Health Authority, Vancouver Island Health Authority, and Fraser Health; in Alberta (University of Alberta/University of Calgary), it would be the Alberta Health Services Board; in Manitoba, it would be the Winnipeg Regional Health Authority; in Ontario and Québec, each Research Hospital has its own Board and affiliation agreement with their respective university; and in Nova Scotia (Dalhousie University) it would be the Capital District Health Authority. Based on the Association of Canadian Medical Colleges of Canada/Association of Canadian Teaching Hospitals Committee on Academic Health Sciences Centres. *Together in the Academic Health Sciences Centre: Renewing the Partnership* (Rowand RS and Sinclair DG, principal authors). ACMC Forum, 1994; 28:1-8.
- 17 Currently there is no formalized national dataset or agreed upon indicators or methodology for capturing the size and scope of AHSCs and the Networks that surround them. Knowing that there are other organizations that have not been included in these estimates, the numbers should be considered as a “floor”, and not a “ceiling”.
- 18 In this section we only discuss the size and scope of AHSCs in terms of the three concepts presented. It should be noted however, as will be discussed under the section on “Resourcing the AHSN” these mandates have resource implications.
- 19 Using 2009 fee-for-service earnings data from the Canadian Institute for Health Information National Health Expenditure Series, it is assumed that specialist physicians account for 55% of the total physician population, and that of this subset, approximately 75% of fee-for-service earnings are generated within AHSCs.
- 20 ACAHO, unpublished. This is a crude estimate that was calculated by looking at the ratio of students to employees for 11 of 37 organizations that report the total number of students and residents per year on their websites, annual reports, or fast fact sheets and extrapolating this figure based on the total number of AHSC employees.
- 21 Canadian Institute of Health Information. Healthcare Providers in Canada, 2007.
- 22 For example, in 2005/06, 90.7% of all medical trainee days in Ontario took place in Toronto Academic Health Sciences Network/Council of Academic Hospitals of Ontario. Source: Council of Academic Hospitals of Ontario.
- 23 Based on the academic healthcare organizations listed in Table 5, this figure is a calculation based on the sum of: (1) the total operating budgets of Research Hospitals for 2008-2009 as described on each organization’s website; and (2) 30% of each regional health authority’s operating budget (which is the proportion of RHA budget attributed by CIHI to hospital care) plus the mid-point of an additional 15% to 30% of the budget for hospital care to represent the added costs of teaching and research activity.
- 24 Based on the academic healthcare organizations listed in Table 5, this figure is a sum of the number of outpatient visits reported in various documents (i.e. websites, annual reports, and fast fact sheets). The outpatient visits may include day treatment, clinics, day hospital etc.
- 25 Based on the academic healthcare organizations listed in Table 5, this figure is a sum of the reported emergency department visits from websites, annual reports, and fast fact sheets for 2008-2009.



- 26 Based on the academic healthcare organizations listed in Table 5, this figure is a sum of the reported admissions from websites, annual reports, and fast fact sheets for 2008-2009.
- 27 Based on the academic healthcare organizations listed in Table 5, this figure is a sum of the number of hospitals beds as reported from websites, annual reports, and fast fact sheets for 2008-2009.
- 28 Based on the academic healthcare organizations listed in Table 5, this figure is a sum of the number of employees as reported from websites, annual reports, and fast fact sheets for 2008-2009.
- 29 Based on the academic healthcare organizations listed in Table 5, this figure is a sum of the number of volunteers as reported from websites, annual reports, and fast fact sheets for 2008-2009.
- 30 Data collected from ACAHO member websites.
- 31 Canadian Institute of Health Information. Healthcare Providers in Canada, 2007.
- 32 Canadian Institute of Health Information. Healthcare Providers in Canada, 2007.
- 33 Information from the Canadian Institute for Health Information and Hay Group, 2008.
- 34 Canadian Institute for Health Information and Hay Group. Benchmarking Database, 2006/07.
- 35 Information from the Canadian Institute for Health Information and Hay Group, 2008.
- 36 The Canadian Institute for Health Information provides the example that a patient between the ages of 60-79 with respiratory failure and no flagged conditions costs about \$6,882. The addition of one flagged condition increases the costs by approximately \$1,000 and the addition of each of the second and third flagged intervention will result in an additional \$20,000 per intervention. Therefore, the patient with 3 flagged conditions will cost approximately \$56,000. Source: CIHI, 2008. The Costs of Hospital Stays in Canada.
- 37 Information from the Canadian Institute for Health Information and Hay Group, 2008.
- 38 Canadian Institute for Health Information and Hay Group, 2008. Benchmarking comparisons of Canadian Hospitals.
- 39 Canadian Institute for Health Information and the Hay Group, 2008. Benchmarking Comparison of Canadian Hospitals. This report differentiates a large community hospital as a hospital with more than 8,000 inpatient cases and more than 50,000 inpatient days.
- 40 Ibid. The cost of a typical patient at large community hospital is approximately \$3,133 while at a teaching hospital the cost is about \$3,636. This represents a 16% difference. See also report by the Hay Group. *The Cost Impact of the Academic Mission of Teaching Hospitals - A Review of the Literature*. March, 2005. This difference is consistent with findings from Finland (Linna M., Hakkinen U., Linnakko E. *An Econometric Study of Costs of Teaching and Research in Finnish Hospitals*. Health Economics. 7:291-305 (1998); the United States (Final Report of the Commonwealth Fund Task Force on Academic Health Centers. *Envisioning the Future of Academic Health Centers*, 2003); and the United Kingdom (Davies S., *Identity and Ideology: A Comparative Study of Academic Health Organizations in the UK and the USA*. 2002).
- 41 Tracy, J. and Zelmer, J., CIHI Survey: *Volumes and Outcomes for Surgical Services in Canada*. Healthcare Quarterly (2005). V. 8. n.4. (In a systematic review of 331 studies on the relationship between outcomes and volume, it was found that 68% of the studies showed better outcomes with higher volume).
- 42 ACAHO, 2010 unpublished. This data is a sum of research revenues for 2008-2009 from ACAHO member websites, fact sheets, or annual reports.
- 43 ACAHO, 2010 forthcoming. ACAHO Funding Flow Survey. This is a survey of the research enterprises of ACAHO member organizations. The data is still in preliminary phases and reflects only 60% of members.
- 44 ACAHO, 2007. Moving at the Speed of Discovery, From Bench to Bedside to Business. Available [www.acaho.org](http://www.acaho.org)
- 45 ACAHO, 2007. Moving at the Speed of Discovery, From Bench to Bedside to Business. Available [www.acaho.org](http://www.acaho.org)



- 46 ACAHO, 2010 forthcoming. *ACAHO Funding Flow Survey*. This is a survey of the research enterprises of ACAHO member organizations. The data is still in preliminary phases and reflects only 60% of members.
- 47 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 48 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 49 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 50 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 51 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 52 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 53 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 54 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 55 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 56 Ibid. The data is still in preliminary phases and reflects only 60% of members.
- 57 “Mind the Gap”: Seven Key issues Aligning Medical Education and Healthcare Policy, *Healthcare Policy* Vol 4, No 2, 2008.
- 58 ACAHO is the national voice of Canada’s research/teaching hospitals, academic regional health authorities and their research institutes. For more information on the Association, visit their web-site at [www.acao.org](http://www.acao.org).
- 59 For more information on each model, please refer to the background report produced by Corpus Sanchez International Consultancy Inc for the AHSC National Task Force: *Academic Health Sciences Centres – A Case Study Describing the Current State and Future Issues*. Final Report, September 2009. See pages 31-33.
- 60 For more information on the initiatives of the Interprofessional Education for Collaborative Patient-Centred Practice, go to: [www.hc-sc.gc.ca/hcs-sss/hhr-rhs/strateg/interprof/index-eng.php](http://www.hc-sc.gc.ca/hcs-sss/hhr-rhs/strateg/interprof/index-eng.php).
- 61 The Widening Gap Between Clinical, Teaching and Research Work. *Medical Journal of Australia*, August 2009.
- 62 Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres – A Case Study Describing the Current State and Future Issues*. Final Report, September 2009. See pages 15-20. Also, see Blackburn & Associates. *Securing the Future of Canada’s Academic Health Sciences Centres – Environmental Scan Report*. Pages 79-81. Available on AHSC NTF web-site at [www.ahsc-ntf.org](http://www.ahsc-ntf.org).
- 63 The Widening Gap Between Clinical, Teaching and Research Work. *Medical Journal of Australia*, August 2009.
- 64 Dzau VJ, Ackerly DC, Sutton-Wallace P, Merson MH, Williams RS, Krishnan KR, Taber RC, Califf RM. The Role of Academic Health Science Systems in the Transformation of Medicine. *Lancet*, Vol. 375, March 13, 2010.
- 65 Provincial Coordinating Committee on Community and Academic Health Science Centre Relations, op. cite. Pages 16-17.
- 66 Ibid.
- 67 Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres – A Case Study Describing the Current State and Future Issues*. Final Report, September 2009. See pages 25-26.
- 68 Taken from the TAHSN web-site [www.tahsn.ca](http://www.tahsn.ca).
- 69 Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres – A Case Study Describing the Current State and Future Issues*. Final Report, September 2009. See pages 23-25.
- 70 Based on correspondence with Dr. Don Philippon, Special Advisor to the Saskatchewan Academic Health Sciences Network.
- 71 Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres – A Case Study Describing the Current State and Future Issues*. Final Report, September 2009. See pages 22-23.

- 72 Issues related to governance of AHSCs is not restricted to Canada. Similar issues are being experienced in the United States, the United Kingdom, the Netherlands, Germany, Sweden, and Singapore when it comes to considering and introducing new governance mechanisms that are designed to improve the alignment between universities and their affiliated academic healthcare organizations. Source: AAHC. *European Strategy & Governance in Academic Medical Centres*. Amsterdam, October 2009.
- 73 National Health Service. *Health Reform Evaluation Programme*. Evaluation of Academic Health Science Centres (AHSCs): Research Brief. 2009.
- 74 UK Department of Health. AHSC Application: Guidance Note. 2008.
- 75 [www.cuhp.org.uk](http://www.cuhp.org.uk), Accessed December 27, 2009.
- 76 Blackburn & Associates. *Securing the Future of Canada's Academic Health Sciences Centres – Environmental Scan Report*. 2009. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org).
- 77 For example, this could include patients with multiple co-existing pathologies (e.g. the diabetic patient with chronic obstructive pulmonary disease [COPD] who requires hip arthroplasty), or those who present with rare and low prevalence or life threatening conditions (e.g. level 1 multiple trauma, high risk obstetrics, multi-system organ failure, rare infectious conditions).
- 78 That said, given the range of partnerships that the private sector (e.g., pharmaceutical, biotechnology, medical and assistive devices) has with the academic health community, several issues have been raised that can impact on future partnerships: (1) with a large number of products coming off patent, the pharmaceutical industry will face a “revenue cliff” which could profoundly affect their ability to fund research and infrastructure; (2) group purchasing processes may result in increased cost efficiencies in absence of considering their impact on other academic initiatives (e.g. Chairs, Fellows, research & education initiatives) that are funded by the private sector; (3) Canada is at a competitive disadvantage when it comes to the implementation of inter-operable health records – which is increasingly important to health research; and (4) lengthy regulatory hurdles are seen as a serious barrier to research and innovation. In this regard, it might prove useful to consider the creation of an Advisory Board of industry leaders to meet with senior leaders within the Academic Health Sciences Network to contribute to the organizations strategic planning.
- 79 Boaro N, Lenahan K, Solway S, Velji K, Jabanoski J, McCumber T, Neary MA, Sabo K. Impact of a Rehabilitation Patient Flow Coordinator in an Acute Care Setting. 2009.
- 80 Truscott T, Matthews F, Hendell H, Bariatric Surgical Assessment Clinic (BSAC). 2009.
- 81 CBC News. Canada Donates \$100 Million to Cancer Stem Cell Research. Available at: [www.cbc.ca/health/story/2008/06/18/clement-stemcells.htm](http://www.cbc.ca/health/story/2008/06/18/clement-stemcells.htm).
- 82 Canadian Institutes of Health Research. Major Strategic Initiatives. Canadian Longitudinal Study on Aging. Available at: [www.cihr-irsc.gc.ca/e/18542](http://www.cihr-irsc.gc.ca/e/18542).
- 83 Provincial Coordinating Committee on Community and Academic Health Science Centre Relations, pages 16-17.
- 84 The Royal College of Physicians and Surgeons of Canada (RCPSC) administers the Clinical Investigation Programs (CIP). The major goal of the CIP is to assist in the career development of clinician investigators in Canada. The program provides a formal postgraduate medical education pathway that fulfils the existing specialty/subspecialty requirements of the RCPSC and provides integrated, structured, and rigorous research training. For purposes of the program, health research includes not only the traditional areas of laboratory and clinical biomedical research, but also such fields as economic and management, and social, behavioral and information sciences as they apply to health and disease.
- 85 CIHR, 2009. Outstanding Canadian health researchers in the spotlight. First ever CIHR-CMAJ Top Canadian Achievements in Health Research Awards. [www.cihr-irsc.gc.ca/e/40288.html](http://www.cihr-irsc.gc.ca/e/40288.html)
- 86 CHSRF, 2010. 2010 Recipient of the excellence through evidence award. Available: [www.chsrf.ca/RecognitionAwards\\_ExcellenceThroughEvidenceRitchie\\_e.php](http://www.chsrf.ca/RecognitionAwards_ExcellenceThroughEvidenceRitchie_e.php)
- 87 CIHR, 2009. Go home. It's good for your knees. Available. [www.cihr-irsc.gc.ca/e/40295.html](http://www.cihr-irsc.gc.ca/e/40295.html)

- 88 See CIHR, 2009. Seeing it through to the end. Dr. Julio Montaner wing the CIHR Knowledge Translation Award. Available: [www.cihr-irsc.gc.ca/e/40676.html](http://www.cihr-irsc.gc.ca/e/40676.html)
- 89 Capital District Health Authority, 2010. “World Calibre Work Being Done by the Halifax Research Community. Available: [www.cdha.nshealth.ca](http://www.cdha.nshealth.ca).
- 90 McNally, N. The Potential Impact of Academic Health Science Centres in the UK and Abroad.
- 91 Commonwealth Fund, Shaller, 2007. Patient-Centred Care, What Does it Take. Available [www.commonwealthfund.org/content/publications/fund-reports/2007/oct/patient-centered-care--what-does-it-take.aspx](http://www.commonwealthfund.org/content/publications/fund-reports/2007/oct/patient-centered-care--what-does-it-take.aspx).
- 92 Tracey, J. and Zelmer, J. 2005. Canadian Institute for Health Information Survey: Volumes and Outcomes for Surgical Services in Canada. *Healthcare Quarterly*, 8(4) 2005:28.
- 93 See for example: (1) the Canadian Institutes of Health Research (CIHR) knowledge to action diagram in the *Journal of Continuing Education in the Health Professions*, Vol. 26, No. 1, Graham ID et al, *Lost in Knowledge Translation: Time for a Map*, pp. 13-24, 2006, John Wiley & Sons, Inc; (2) discussion in Fervers B et al, *Adaptation of Clinical Guidelines: Literature Review and Proposition for a Framework and Procedure*. *International Journal of Quality in Healthcare*, Vol. 183, No. 3; (3), Registered Nurses Association of Ontario (2002). Toolkit: Implementation of Clinical Practice Guidelines. Toronto, Canada; and (4) See also various authors in Lemieux CL and Champagne F (editors). *Using Knowledge and Evidence in Health Care: Multidisciplinary Perspectives*. University of Toronto Press, 2008.
- 94 Canadian Institutes of Health Research, 2010. Strategy for Patient Oriented Research: A Discussion Paper for a 10-Year Plan to Change Health Care Using the Levers of Research.
- 95 A number of frameworks for evaluating network effectiveness exist that may form a useful starting point for developing performance metrics for the Network itself. For further discussion and possible examples, see: (1) Innovation and Progress: The Role of Networks Consensus Statement of the Fourth Networks Leadership Summit (NLS IV) Banff, Canada, January 14, 2009, available: [www.nccmt.ca/pubs/NLS\\_ConsensusReport\\_en.pdf](http://www.nccmt.ca/pubs/NLS_ConsensusReport_en.pdf)); (2) Provan, K.G., Milward, H. Do Networks Really Work? A Framework for Evaluating Public Sector Networks. *Public Administration Review*. July/August, 2009; (3) Lemieux-Charles, L., Chambers, L.W., Cockerill, R., Jaglal, S., et al. Evaluating the Effectiveness of Community-Based Dementia Networks: The Dementia Care Networks’ Study. *The Gerontologist*, 45(4), 456-464, 2005.
- 96 See footnote 3. *Transforming the Health System for Nova Scotia – A Response to the Provincial Health Services Operational Review Report, 2006-2007*. Government of Nova Scotia. *Exploring the Contributions of Academic Hospitals in a Changing Health Care Environment – A CAHO Discussion Paper*. Council of Academic Hospitals of Ontario. February 2006.
- 97 *Towards a Virtuous Cycle: The Changing Face of Academic Health Centres*, Academic Medicine, September 2008.
- 98 *Academic Health Centres: Leading Change in the 21st Century*, Institute of Medicine of the National Academies, July 2003.
- 99 The potential for confusion and complexity is amplified by the range of models and structures currently in place for governance and management of health care organizations in the various provinces and territories. The current systems design and organizational models in the 13 health care systems in Canada represent a wide range of options and include: (1) Direct management of the health care delivery by a provincial department of health (PEI); (2) Governance of health “authorities”, “regions” or “districts” by a governing board and day-to-day operational; (3) leadership by a unified senior management team (e.g., British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and Newfoundland) – and these models are also in various stages of transition and development and include the recent creation of one health authority for Alberta to a model where there are 13 regions In Manitoba; (4) Individual hospital corporations, each governed by a governing board and managed by a senior management team but clustered into semi-organized larger regional organization or networks (18 Agences de la santé et des services sociaux in Quebec and 14 Local Health Integration Networks in Ontario); and (5) Individual hospital corporations/entities that relate directly to their respective provincial or territorial government (Yukon, NWT and some organizations in other provinces such as the IWK Health Centre in Nova Scotia).

- 100 *Towards a Virtuous Cycle: The Changing Face of Academic Health Centres*, Academic Medicine, September 2008.
- 101 For more background information on the nature and structure of le RIUS, please go to the following web-site: [www.santemontreal.qc.ca/en/portrait/ruis.html](http://www.santemontreal.qc.ca/en/portrait/ruis.html).
- 102 The Commonwealth Fund. *Envisioning the Future of Academic Health Centers*. Final Report of The Commonwealth Fund Task Force on Academic Health Centers. February 2003.
- 103 The Commonwealth Fund. *Envisioning the Future of Academic Health Centers*. Final Report of The Commonwealth Fund Task Force on Academic Health Centers. February 2003.
- 104 Corpus Sanchez International Consultancy Inc. *Academic Health Sciences Centres in Canada – A Case Study Describing the Current State and Future Issues*. Final Report, September 2009. Available on the AHSC NTF web-site at [www.ahsc-ntf.org](http://www.ahsc-ntf.org).
- 105 For more on the need for improved alignment between (provincial, territorial and federal) governments, see Shugart I. *AHSCs – An Indispensable Partner for Governments*. Healthcare Papers, Vol. 2., No. 3, 2002, and Ward T. *Governments, Policy Directions and the Future of Academic Health Science Centres*, Healthcare Papers, Vol. 2, No. 3, 2002.
- 106 Standing Senate Committee on Social Affairs, Science and Technology. *The Health of Canadians – The Federal Role. Final Report on the State of the Health Care System in Canada*. October 2002. Page 48.
- 107 This would include the Canadian Institutes of Health Research, the Canada Foundation for Innovation, the Indirect Costs of Federally-Funded Research, Canada Research Chairs, Genome Canada, Networks' Centres of Excellence, Centres of Excellence in the Commercialization of Research.
- 108 In the view of the National Task Force, AHSNs are the single most important Canadian asset to protect the nation against threats to its security in an increasingly hostile global village. Particularly, where bioterrorism has replaced nuclear warfare as a real potential threat to Canadian security and the security of other western democracies and eco-terrorism has been identified as an emerging threat. The definition of national security, traditionally viewed in terms of military security and repulsion of external threats to our national interests from hostile acts, has been irrevocably altered by globalization. Armed conflict is now joined by threats to human health posed by global pandemics and by the impact of disease on the health and economic well-being of distant nations and populations which in turn breed discontentment and hostile acts directed at more stable and wealthier nations. Even the impact of global climate change and the potential impact it may have on food supplies is now seen as an important foreign policy and domestic security issue.
- 109 Discretionary revenue is typically non-Ministry net income generated from non-government funded initiatives such as parking, television and telephone rentals, interest on retained earnings, net rental income from concessions, leased office space and the like. Such income is discretionary to the extent that the health care organization can choose to use it as the Board sees fit but typically is applied to find deficits in operations, capital acquisitions such as equipment and the owner's share of facility development costs, information technology where not funded by the provincial/territorial ministry. Source. Rowand, RS. December, 2009.
- 110 Concerns have been expressed by a number of constituencies at current funding levels for the Canadian Institutes of Health Research. Furthermore, while funding through Indirect Costs of Federally-Funded Research is welcome, the current level of funding is insufficient to cover the full costs indirect costs of research. At the same time, while the health charities fund research, they do not cover the associated indirect costs. This leaves a gap that must be funded from other sources in the overall collective budgets of the AHSN and its partners. Essential facilities for student education including classrooms, library facilities, learning and simulation labs, call rooms, and study space are also frequently not supported by capital and operating grants provided to health care organizations and must be funded from other sources. This discourages the decentralization of educational venues regardless of the benefits of distributed models of health sciences education.
- 111 Baron, RJ, (2008) *Medicine cut off from its roots: Context matters in medical education*. Health Affairs. 2008 Project HOPE. 27:1357-1361.
- 112 Blackburn & Associates. *Securing the Future of Canada's Academic Health Sciences Centres – Environmental Scan Report*. 2009. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org).

- 113 Blackburn & Associates. *Securing the Future of Canada's Academic Health Sciences Centres – Environmental Scan Report*. 2009. Available on the AHSC NTF web-site [www.ahsc-ntf.org](http://www.ahsc-ntf.org). AHSC survey conducted by Blackburn & Associates.
- 114 *The Widening Gap Between Clinical, Teaching and Research Work*. *Medical Journal of Australia*, August 2009.
- 115 The National Task Force fully recognizes that the Territories receive federal funding via the Territorial Formula Financing.
- 116 Statistics Canada. Science Statistics – Science, Innovation and Electronic Information Division, Catalogue Number 88-001-X1E/ISSN1209-1278, March 2007.
- 117 For example, the Health Action Lobby (HEAL) has called on the federal government to establish a *National Health Human Resource Infrastructure Fund over five years*. ACAHO has called on the federal government to create a five-year *National Health Delivery Infrastructure Fund*. In each case, the Funds are designed to be time-limited, issue-specific and strategically targeted.
- 118 The Commonwealth Fund. *Envisioning the Future of Academic Health Centers*. Final Report of The Commonwealth Fund Task Force on Academic Health Centers. February 2003.
- 119 The eight questions were: “(1) Will we – in your country – see a concentration to fewer more prominent AMCs?; Over the next three years, relative to day, to what extent; (2) will your external network change?; (3) will the degree of integration in governance between your university and hospital change?; (4) will the sources of your revenue change?; (5) will you change how you justify AMCs higher cost of service to payers?; (6) will you change the areas you invest in?; (7) will your management focus shift between research, education and research?; and (8) what is the single largest strategy or governance challenge you will need to solve this year?”
- 120 The Commonwealth Fund. *Envisioning the Future of Academic Health Centers*. Final Report of The Commonwealth Fund Task Force on Academic Health Centers. February 2003.



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Academic Health Sciences Centres - National Task Force

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