

Review

The promise of e-Health – a Canadian perspective

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Abstract

Canadians value their health care system above any other social program. Canada's system of health care faces significant financial and population pressures, relating to cost, access, quality, accountability, and the integration of information and communication technologies (ICTs). The health-system also faces certain unique challenges that include care delivery within a highly decentralised system of financing and accountability, and care delivery to a significant portion of the population sparsely distributed across a landmass of 10 million square kilometres, in areas of extreme climatic conditions. All of these challenges are significant catalysts in the development of technologies that aim to significantly mitigate or eliminate these selfsame challenges.

The system is undergoing widespread review, nationally, and within each province and territory, where the bulk of care provision is financed and managed. The challenges are being addressed by national, regional and provincial initiatives in the public, private and not-for-profit sectors.

The promise of e-Health lies in the manner and degree to which it can mitigate or resolve these challenges to the health system and build on advancements in ICTs supporting the development of a health infostructure. Canada is actively developing and implementing technological solutions to deliver health information and health care services across the country. These solutions, while exciting and promising, also present new challenges, particularly in regard to acceptable standards, choice of technologies, overcoming traditional jurisdictional boundaries, up-front investment, and privacy and confidentiality.

Many organisations and governments are working to address these challenges. The Canadian Institute for Health Information (CIHI) will play an increasingly significant role in these initiatives, as the management of health information becomes a more crucial factor in the successful delivery of health care services in the new millennium.

Background

Canada has a publicly financed system of health care, known as "Medicare". The system provides access for all Canadians to comprehensive coverage for medically necessary services. The system is comprised of ten provincial and three territorial government health insurance plans. The provinces and territories plan, finance and manage

the provision of hospital care, physician and allied health care services, some drug costs and public health. The system is "national" in that the federal government assists the financing of provincial and territorial plans, and that the plans share an adherence to national health-care principles set at the federal level. An element of the health system is individual private expenditures, largely on

prescription drugs, which currently accounts for approximately 27% of health care expenditures across the country.

Challenges

Our system of health care faces a number of pressures and challenges to both its national principles and plan financing. Since its inception, Medicare, has been faced with questions concerning its core principles – of public administration, comprehensiveness (provision of medically necessary services), universality (availability to all citizens), accessibility and portability (entitlement to coverage across provincial/territorial lines). The old historic arguments have been renewed in the face of serious fiscal constraints.

Geography has a significant place in the current critique and future development of the health system. Canada is a country of only 30 million people spread unevenly across 10 million square kilometres of the earth's surface (3/km²). While the majority is concentrated in a few urban areas a significant proportion is scattered across the landscape in hundreds of geographically isolated communities, many in areas of extreme climatic conditions. Canada's newest territory, Nunavut, for example, has 27,000 people spread across 2.1 million km² (.001/km²), large communities on several remote arctic islands locked in frozen sea-ice and snow most of the year, temperatures varying seasonally between -50° to 30°C, and no inter-city roads. These factors pose serious challenges to the provision of equitable, accessible, and high quality care.

The political structure of funding of health services is a complicating factor and a matter currently of intense scrutiny and considerable controversy. The division of both political, managerial and fiscal accountability across provincial and federal lines has created tensions particularly around the question of the current level, and most appropriate future level of funding.

The demographic and human resource picture illustrates other challenges to health care. Seniors constitute one of the fastest growing groups in Canadian society. By 2041, about 23% of the population will be over 65, up from 12% in 1995. This growing portion of the population will inevitably require, it is assumed, the devotion of a larger proportion of expensive health resources [1]. Within the various health professions there are challenges related to numbers of providers, and their distribution. It is a common and significant problem that many areas of the country remain un- or under-served even though there is a high proportion of professionals to general population. Canada is a country of cultural diversity, which has created some unique health challenges. From the last full national census, of 30 million people, 18 million speak

English, 7 million French and 5 million a mother-tongue other than English or French (official languages). Not being able to speak either official language is an enormous obstacle for newcomers when seeking out or obtaining health care. The various rights of English or French speaking minorities to care in their own language directly impacts government planning, fiscal considerations and distribution of services (which may overlap in kind, but differ in language).

Total health care spending was \$95.9 billion in 2000 and \$102.5 billion in 2001 (current dollars), representing annual increases of 7.1% and 6.9%, respectively [2]. The amount of federal funding and the proportion of federal vs. provincial/territorial spending is at issue. Arguments abound about it being less or more than it was or should be, and whether it must increase or decrease. Is the growth sustainable? Are the private/public and federal/provincial funding proportions appropriate? There are many questions being considered. Alternative funding and management models are being actively explored and implemented at all levels of government.

The history of Canada's Medicare system, our geography, political structure, demography and finances are exerting pressures for change on the delivery of health care. Federal, provincial and territorial governments are struggling to renew or reinvent the health care system to make it "affordable" while also living up to the commitments to and expectations for a public, accessible, comprehensive, universal, and high quality health care system. In this context, advancements in ICTs, and the subsequent interest in e-Health holds much promise in mitigating if not eliminating, a number of the challenges faced by our current and much valued health-care system.

Discussion

Supporters of e-Health initiatives generally recognize that advancements in ICTs, the wide-scale review of the health-system, and the increasing interest in exploring new approaches to health-care delivery, financing and management can benefit the continued development of e-Health initiatives. It can be argued, as this author does, that e-Health initiatives in Canada can play a significant role in mitigating the impact of some of the challenges to the system described above, if not eliminate many of them from the debate altogether. Health data is already essential to health services resource planning in Canada. It can also play a substantial role in reducing duplication of services, realizing operational efficiencies, and improving the overall quality of health care.

Promise of e-Health

But what exactly is e-Health, and what is exactly its promise?

The term e-Health has been used to describe a variety of activities including almost any electronic exchange of health-related data, voice or video. The definition that most nearly describes what is understood within the context of this article is the following:

e-Health is a consumer-centred model of health care where stakeholders collaborate, utilizing ICTs, including Internet technologies to manage health, arrange, deliver and account for care, and manage the health care system [3]

While definitions of what correctly falls within the scope of e-Health may vary, what is consistent, is the excitement around perceived benefits and the rush to move forward with collaborative opportunities using advanced technologies in health information.

e-Health has almost no "history", nor baggage, as it enters the health-care discussion. It offers a means to draw together in collaborative partnerships governments, organisations and professionals in ways that have not before been possible. Numerous stakeholders, including consumers, clinicians, administrators and politicians, are already actively involved in e-Health initiatives.

ICTs are able to reduce the effects of geographic isolation, harsh climate and low population densities by providing a mechanism for remote data access, health-information sharing and medical support; as well as clinical examination, diagnosis and treatment: bringing the health-system and health-care provider to the patient.

ICTs in e-Health initiatives increase our ability to meet challenges in the provision of primary and tertiary care. Subsequently, they may reduce or prevent adverse patient outcomes, reduce costs to the system of repeat diagnostic testing, redundant record keeping, and high travel costs associated with seeking and receiving care in centres located far from the patient.

Various new ICTs transcend traditional health system divides, offering a means to develop more complicated and advanced data sharing, cooperation and cost-sharing between jurisdictions, professionals and facilities. Political concerns about health-system financing, viability and sustainability are moderated by the potential for cost- and risk-sharing provided by ICTs and e-Health initiatives.

The question of the provision of quality health services to a multi-lingual and multi-ethnic population are also met in part by e-Health. The financial stress being felt by a burgeoning high-needs aging population will be somewhat alleviated as cost savings are found through e-Health. The aging population will be better served by a reduction in repeated testing, drug interactions of inappropriate pre-

scriptions, facilitated by an easily accessible electronic health record. They will benefit from a reduced requirement for long-distance travel for care, and may even be able to remain in their own communities and homes longer, without the oft required move to centralized facilities for higher-needs late-life care.

e-Health initiatives provide a means to overcome linguistic and cultural challenges to the health-system. In some jurisdictions governments are legally required to provide care in French and English, in others they provide some level of service in dozens of languages, and in others the immigrant populations suffer for the lack of language appropriate services. Repeated clinical interviews and tests, multiple referrals and other repetitive and perhaps unnecessary contacts with the health system and professionals is a barrier to care for many whose abilities in French and/or English are limited.

All manner of health-care providers can benefit from e-Health initiatives and the use of ICTs in clinical settings. e-Health can allow for access to patient records by pharmacists, sharing of information between clinicians and even between same-site facilities. Desk-top and live on-line access to patient records, information that supports clinical decision making, and health-system information, such as on-line booking of specialists, along with a host of other possible uses of the new technologies will improve the clinical bench-strength of providers, patients and the consumer. e-Health technologies also allow for the development continuing professional education for providers in isolated locales.

e-Health reduces the stress on an often overburdened system. Seasonal swings in transmittable diseases, such as the flu, have led to crippling overuse of the emergency services in hospitals. E-Health mitigates this by providing a means for some out-of-hospital care, and by providing information on what is a condition requiring immediate emergency treatment via tele-triage centres.

Fiscal challenges are mitigated by ICTs and e-Health developments that, as described above, reduce travel requirements and waiting times, increase cost- and risk-sharing, reduce replication and redundancy, improve positive outcomes, reduce overall system-management and patient costs, and improve the quality of information available outside of acute-care facilities.

By increasing our capacity to meet unique geographic, population and political challenges, ICTs and e-Health moderate the political debate and public concerns about the sustainability of the current health-system.

e-Health challenges

Canada faces a number of challenges in the development of effective e-Health solutions. Of primary concern is the inertia of traditional agendas, and ways of doing things. Divisions between health-professions, the public-private sectors, facilities, levels of government and cultural communities generally mitigate against large national inter-jurisdictional projects in the public sector, and new large-scale investments in the health sector.

The technologies themselves, as well as their deployment, are challenging matters. There are questions about how to properly automate the health-system, and the desktops of clinicians. Which technical standards are to be adopted? Is the current level of technology and technological-sophistication of the providers and public sufficient to the task? What proprietary products will the public sector invest tax dollars in? How do we integrate the current system's data "silos"? Some of the technologies remain unproven in extremes of climate and in far-north locations of the earth's surface. There are limitations imposed by the fragility and newness of certain technologies and products in situations where ongoing technical maintenance and operational services are next to non-existent.

Other challenges include the development of a national "infostructure" to support inter-jurisdictional data-sharing; the establishment of data and technical standards and health informatics systems; and, financial investments in technology and deployment. There are challenges with the education of sufficient numbers of informatics specialists to implement, operate, manage and continue the development and improvement of the technologies and the system.

Though Canada has claimed one of the highest Internet user-rates in the world, this level of sophistication is not played out to the same degree across the country. Socio-economic, cultural and geographic influences limit connectivity, performance and possibilities. Public and professional acceptance of the new technologies in the place of old ways – such as, keying up a live on-line Internet consultation instead of sitting in a waiting room – is essential.

An increasing concern with personal privacy and information confidentiality and the recent proclamation of Privacy and Confidentiality legislation across the provinces and territories is a considerable challenge to the development of inter-jurisdictional data sharing arrangements and to storage and manipulation of data holdings (especially patient records).

Clearly, large financial and human resources must be invested in e-health to realize the full potential of the tech-

nology. Actual expenditure on known Canadian e-health projects was a relatively low \$31.7 million, in 1999–2000. Evidence suggests that e-Health is at least 10 years behind other information management intense sectors, such as banking.

Meeting the challenges

The Canadian health sector has positioned itself to address challenges to both the health-system in general and to the development and implementation of e-Health solutions. A number of initiatives and organizations have sprung up in the last decade to meet the challenges of geographic isolation, climate extremes, shifting population demographics, political dynamics, cultural differences, financial considerations, limitations imposed by technologies, lack of standards, low levels of automation in clinical settings and privacy and confidentiality.

In 1994 a number of government and nonprofit health and statistics agencies were consolidated under the Canadian Institute for Health Information (CIHI), to improve the health of Canadians and the health system. Mandated by Canada's federal, provincial and territorial health ministers, CIHI is a national, not-for-profit organization responsible for developing and maintaining the country's comprehensive health information system.

CIHI's core e-Health related functions include identifying health information needs and priorities; and collecting, processing and maintaining data for comprehensive and growing health databases covering human resources, health services and expenditures. CIHI also coordinates the setting of national standards for financial, statistical and clinical data, as well as standards for health informatics, such as HL7, and telematics.

Since 1999 CIHI has led the *Roadmap Initiative* collaborative effort between CIHI, Statistics Canada, Health Canada and many other groups at the national, provincial, territorial, regional and local levels. The initiative's aims include the development of new national data holdings, expanding existing ones, and fostering better data and technical standards for gathering information and for data protection.

CIHI has helped shape the national agenda for information management and information technology standards in health care. It provides a neutral forum for standards discussion among Canada's health and health IT leaders.

In 2000 the federal, provincial and territorial governments created the independent, not-for-profit Canadian Health Infoway (*Infoway*) corporation. The federal government committed to provide a \$500 million budget. The vision of *Infoway* is a high-quality, sustainable and ef-

fective health care system supported by a pan-Canadian health infrastructure that provides residents and health care providers timely, appropriate and secure access to the right information whenever and wherever they enter the health care system.

The *Infoway* mission is to foster and accelerate the development and adoption of electronic health information systems with compatible standards and communication technologies on a pan-Canadian basis. The objectives of the *Infoway* corporation are:

- To accelerate the development and adoption of modern systems of health information and communication technologies.
- To define and promote standards governing shared data to ensure the compatibility of health information networks:
- To support the adoption of such standards for health information and compatible communications technologies for the health sector,
- To enter into collaborative arrangements as required with the governments of Canada, provinces and territories, corporations, not-for-profit organizations and other public and private partners for the development and adoption of standards and technologies, and
- To incorporate standards that protect personal privacy and confidentiality of individual records and security of health information.

Infoway is a major development in Canada and offers much promise for the acceleration of e-health initiatives.

The provincial governments are also active players in the development of e-Health initiatives. The Newfoundland and Labrador Centre for Health Information, for example, is mandated by the province to develop a Health Information Network (HIN) to link provincial hospitals, long-term care facilities, doctors, pharmacists, and health and community services. The Saskatchewan Health Information Network is establishing (electronic connections to enable access to various types of health and patient information between health service sites across the province, including physicians' offices, health centres, home care providers, hospitals, emergency response sites and nursing homes. Alberta *we//net* (read "wellnet") was founded in 1997 to address access to and the quality of health care, and the increasing costs associated with care delivery. Alberta *we//net* is the umbrella for a series of province-wide and regional initiatives to build an integrated health information network in that province and to facilitate im-

provements to the delivery of health services by improving access to health information.

Challenges presented by the accessibility and provision of care in remote communities have been under considerable scrutiny. In recent years numerous e-Health initiatives have been actively addressing the challenge presented by geography. Programs such as Ontario's NORTH (Northern Ontario Remote Telecommunications Health) Network, and the British Columbia Peace Liard Telemental Health provide remote specialist consultations, continuing medical education and patient education to isolated locations. They utilise two-way television and simultaneous transmission of visual and audio signals from various medical peripheral devices, such as electronic stethoscopes and otoscopes.

Challenges concerning standards, technologies and product choices are being considered at a number of levels. CIHI and the Canadian Standards Association lead Canada's participation in the International Organization for Standardization's *Technical Committee on Health Informatics* (ISO TC215). Through this committee Canada is active in the development of national and international standards for data encryption, country identifiers, data models and other matters that are the technical bedrock on which e-Health initiatives are based. Technical and product considerations are being addressed by numerous provincial and inter-provincial organizations, such as Ontario's NORTH (Northern Ontario Remote Telecommunications Health) Network, and the Central BC and Yukon Telemedicine Project.

The promise of intergovernmental cooperation and partnership is being realized across all of the provinces and territories. The Western Health Information Collaborative (WHIC) is an example of such cooperation, between four western provinces and the three northern territories to explore collaborative e-Health initiatives. WHIC is actively engaged in the utilization and further development of standardized electronic insurance claims, implementation of electronic health records, inter-jurisdictional provider registries, consumer on-line information access and clinical information support networks.

Integrating and coordinating public and private sector e-Health initiatives is taking place along a number of lines. The National Electronic Claims Standard project, coordinated by CIHI, is working to develop a single electronic health claims standard leading to consistency in data capture, increased efficiency, accuracy and education throughout the health sector; and, providing the foundation for information exchange. The project is a collaborative effort of federal and provincial ministries, public associations and private companies.

Governments and large national agencies are not the only driving forces in e-Health. Private companies, hospitals and health-care provider associations are actively and creatively involved in e-Health initiatives. Numerous private companies have developed and are promoting the development of electronic health records, systems for health care transaction and business-to-business e-commerce, and clinical automation systems in networks of clinics, private doctor's offices and local hospitals and specialists. Large hospital facilities and multi-site hospital corporations are developing mechanisms to share data, records and other information within and between sites and departments. The Hospital for Sick Children in Toronto, Ontario is active in the provision of national and international remote health consultation and care. Their International Telehealth Program, currently provides second opinion patient referrals through Telehealth technology with facilities in Argentina and Israel. Numerous hospitals and paediatricians in Ontario collaborate in the Child Health Network-Health Information Network (Hi-Net.) In HiNet clinical records from consenting patients (or parents) are stored and access provided to health care professionals. The system is currently being extended across Ontario and to interested paediatricians in other jurisdictions.

e-Health can help resolve questions of equitable access to services in French and English by directly addressing the question of multi-lingual service provision. Both the Telehealth Ontario telephone-nursing project and the British Columbia Healthguide Nurseline offer phone consultation with nurses that utilise over-the-phone translation services with a pool of 100 available languages. The development of integrated readily accessible electronic health records reduces redundant contacts with the system and providers, providing relief for non-English/French speakers from the stress of repeated unnecessary contacts with the system.

Various legislation being enacted at all levels of government across the country, are aimed in part at improving confidence in the privacy and confidentiality of personal health information. In consultation with various health sector agencies, this legislation is being drafted, or applied through regulation, in a manner that also accommodates the appropriate use of health information for health care delivery and health system management.

Patients have responded positively to many of the new technologies and their application. While many telehealth technologies and projects are relatively new, evaluations of early results suggest significant promise. Recent systematic reviews of studies of patient satisfaction with telemedicine indicated that under ideal circumstances pa-

tients and care providers accept and are generally satisfied with the care they receive and can give using e-Health.

Summary

Canada is faced with challenges to the continued success of its health care system. Some of these challenges are uniquely Canadian, while others are common to many other countries. These challenges include geographic considerations, cost, demographics, service access, quality, accountability, and the integration of ICTs.

ICTs appears to hold the key to meeting some of the challenges that face Canada's health care system. The promise of e-health is yet to be realized but appears to be an inevitable part of Canada's future reality. The issues that are linked to e-Health are being addressed, in part, by numerous national, provincial and territorial initiatives, and in partnerships between the levels of government and across the public and private sectors.

Canada is making significant strides in the development, implementation and ongoing management of ICTs within the context of an integrated inter-jurisdictional e-Health component to the provision and management of health care.

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