Telehealth in Canada:

Clinical Networking, Eliminating Distances

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July 1997

Preface

In its Phase 1 final report, *Connection Community Content: The Challenge of the Information Highway*, released in September 1995, the Information Highway Advisory Council (IHAC) made several recommendations relating to the creation of a health information infrastructure in Canada. Health was seen to be one of the key application areas of the Information Highway, enabling significant cost savings in the delivery of health care, while at the same time improving the quality of care for Canadians.

Building on this theme, in September 1996, the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) released its report, *Towards a Canadian Health Iway: Vision, Opportunities and Future Steps*. Several background studies and workshops held during 1996 formed the basis for this report, which was produced by CANARIE's Health Information Infrastructure Advisory Committee, in partnership with Health Canada, Industry Canada, the Stentor Alliance and AT&T Canada. The report set out the following vision of a Canadian Health Information Network, which it called the Canadian Health Iway:

> The Canadian Health Iway (CHI) will be a virtual 'information centre', created and used by communities and individuals across Canada. It will be open and accessible, yet assure sufficient confidentiality and privacy to assist decision-making by health professionals and patients; it will support research and training and facilitate management of the health system; and it will respond to the health information needs of the public. The CHI will be an agent of change for the health system, contribute to improving the health of Canadians, and foster the development of globally competitive Canadian technologies and services.

In February, 1997, the National Forum on Health released its final report, *Canada Health Action: Building on the Legacy*. The report included a number of recommendations regarding the future of Canada's health system. At the heart of the Forum's message, however, was the urgent need to transform the basic concept of Canada's health system, with a shift in emphasis away from health *care* and towards the broader concept of *health* itself, including key determinants of health, such as socioeconomic conditions and education about healthy lifestyles. In its report, the Forum recommended the adoption of an evidence-based system, which it defined as "the systematic application of the best available evidence to the evaluation of options and to decision making in clinical, management and policy settings". It also called for federal leadership in this area through the development of a nation-wide, population-health information system.

These three reports and the discussion surrounding them have confirmed the view that knowledge, evidence and information will be central to the health services and systems of the future. A key agent of change in the transition to this future will be information and communications technologies, or ICT.

Over the past two years, CANARIE's Health Information Infrastructure Advisory Committee, in partnership with Industry Canada and Health Canada, has sponsored a series of workshops, conferences and consultations involving key stakeholders from Canada's health and ICT communities. The most recent event was held in Quebec City in April 1997, and was called, *Telehealth in Canada: Clinical Networking, Eliminating Distances.* This conference brought together 150 stakeholders from the health community, government and the private sector. Forty papers were presented addressing the many facets of telehealth across Canada. At its heart, the conference was a showcase of pioneering efforts, outcomes, experiences and achievements in the development of Canada's Health Iway.

Throughout the conference, participants were guided by several fundamental questions: Does telehealth improve health outcomes? Does it enhance the decision-making capacity of physicians and administrators? How does telehealth affect quality of care and quality of life for the patient? Does telehealth create jobs in the health sector? Through focusing on these questions, the *Telehealth in Canada* conference provided critical perspectives on some of the very challenging issues facing those who are building Canada's future health system. It also presented a foundation for future collaboration, partnering and joint learning.

This report is an abridged version of the insights gleaned from the presentations made during this conference. Abstracts and papers, where available, contact information for the presenters, a list of conference participants, projects and companies, and information on CANARIE's current and future telehealth activities and initiatives are available on CANARIE's web site at http://www.canarie.ca/telehealth.

1.0 Introduction

As a new application of information technology, telehealth builds on two Canadian strengths: the companies of our information and communications technologies sector, and our universally health care system. This integration of ICT and health presents an array of new opportunities, both for the development of new systems to support the health of Canadians, and for the growth of new enterprises that can commercialize telehealth expertise and technology for domestic and foreign markets.

With our large landmass and widely distributed population, nation building in Canada has often focused on the creation of infrastructure to distribute goods and connect people to one another. This focus on infrastructure started with the railways and canals of the 19th century and progressed on to the highways, telephone systems, microwave systems and fibre-optic networks of the 20th century. Along with eliminating or reducing the impact of distance and isolation for Canadians, this focus on infrastructure has also contributed to the creation of Canadian capabilities and expertise in related areas, from switches to satellites.

Building on the telephone networks of earlier decades, modern telecommunications is increasingly linked to the world of computers. It is now clear that the future role of telecommunications networks will simply be to transfer digital information, whether the information is an email message, a voice call, an audio clip, a digitized image or a video transmission.

This vision of the role of future networks, and the speed with which it has been adopted around the world, is best represented by the development of the Internet. This global network of networks now supports applications in virtually every industry and affects almost every aspect of life, from education and health to entertainment and business. Through their ability to transform the basic structures of the economy and society, the new ICT that underlie the Internet are producing changes that some say are as profound as those associated with the Industrial Revolution.

In Canada, the new technologies of the ICT sector represent a $65 billion a year industry that employs well over 400,000 Canadians. It is the fastest growing sector internationally, and for almost a decade the growth of the domestic sector has far surpassed the growth of the Canadian economy as a whole. Largely because of the size and historical strength of Canadian telephone companies and telecommunications equipment manufacturers, the ICT sector accounts for 39% of Canada's private sector R&D spending, although it is only 6%

of the economy. Canadians are also leading edge *users* of these technologies, with penetration rates for telephones, cable TV, computers and Internet use each among the highest in the world.

The strengths of Canada's ICT sector are matched by the support and services provided through the country's "social" infrastructure, the jewel of which is the health care system. In terms of both its contribution to the country's highly-regarded quality of life and its importance to Canadians, the significance of the health care system cannot be overstated. Indeed, in a 1996 poll, Canadians ranked the health care system as the top symbol of the nation, above the Canadian flag, the Parliament buildings and hockey. It is a vital part of the social fabric of the country that unites Canadians from coast to coast -- an apt analogue of the physical infrastructure of railroads, highways and telecommunications systems.

Nonetheless, the Canadian health care system is undergoing great change. Steps taken to reduce federal and provincial deficits have placed a strain on the ability of governments to meet rising health care costs. All jurisdictions and all institutions involved in health care are seeking ways of delivering services more efficiently.

Given this fiscal and budgetary climate, the need to collect and use information more intelligently to improve services and reduce costs is obvious. It does not make sense to create duplicate medical records, to needlessly repeat diagnostic tests, or to prescribe multiple, potentially conflicting drugs, simply because appropriate information is not collected systematically or made readily available to institutions, health care professionals and policy makers.

Seen in this context, health information systems and new telehealth applications offer numerous opportunities for cost reduction in the health system. More importantly, because of their focus on streamlining processes and making more efficient use of human, physical and information resources, health information systems and telehealth can become agents of change for the health system as a whole. They also offer opportunities to renew the focus on the five principles of the *Canada Health Act* -- <u>accessibility, universality, comprehensiveness, portability and public administration</u>.

More specifically, there is significant potential for telehealth to dramatically improve access to the highest *quality* of care. For example, through telehealth a physician in a rural community could tap into a database to access relevant information on a patient visiting the area from elsewhere. Or a rural physician could send an X-Ray to a major centre for analysis by a specialist, saving the patient a long and expensive trip. Or a

physician could be helped in a diagnosis by going on-line to determine whether a contagious disease may have made its way into the local area. Providing the right information to the right person at the right time, offers a solid foundation for a healthier population.

The challenge for Canada is to merge one of the world's best health systems with an infrastructure that remains at the cutting edge of innovation. If we are successful in meeting this challenge, we will be world leaders, creating jobs for Canadians that are part of the evolving knowledge-based economy and maintaining the benefits of one of the most efficient health care systems in the world.

The Quebec City *Telehealth in Canada Conference* was about meeting this challenge. The place to begin was with sharing lessons learned from telehealth experiments and pilot studies, and discussing the opportunities and potential pitfalls that may lie ahead.

2.0 Canadian Telehealth Pioneers

In their article, *Telemedicine Experience in Canada*, Dr. Max House and Dr. Rod Elford note that the story of telehealth in Canada is one of experimentation and innovation in response to the challenges of practising medicine posed by Canadian geography[1]. Originating as a means of performing remote consultations, Canadian experience in telehealth began four decades ago. In 1956, Dr. Feindel, a Saskatoon neurosurgeon used a closed circuit television system to transmit live electrocorticography tracings. Two years later, Dr. Jutras, a Montreal radiologist, pioneered teleradiology. Small-scale experiments and trials such as these continued for almost 40 years, involving a small group of pioneers and researchers supported by equally small government subsidies and R&D grants.

Today, a new generation of telehealth pioneers has been able to share their experiences with us (Appendix 1). Recent pilot projects have furthered Canadian competencies in performing remote teleconsultations, in application areas such as cardiology, radiology, dermatology and psychiatry. As well as improved access to specialists from rural and remote areas, teleconsultations are now seen as providing such benefits as: a lessened feeling of isolation on the part of remotely-located physicians; technology-mediated back-up for remote physicians; dramatically lower turn-around times for remote analysis of medical images; and continuing medical education for rural physicians.

Telehealth is about using tools of ICT to create *intelligent connections*, about leveraging

the power of networks to enhance the efficiency and effectiveness of many dimensions of health care. In emergency situations, for example, ambulances can be connected to a dispatch centre, and patients can be effectively screened for transport to a major centre for treatment. Current experiments and pilot studies focus on a range of applications, including integration and information-sharing across hospitals, community health centres, clinical laboratories and home care sites. Information and communications technologies are also at the heart of the "electronic patient record", which will allow the creation of intelligent community health information networks that provide the right information to the right person at the right time.

(CANADIAN HEALTH IWAY GRAPHIC – HERE)

Telehealth also affects family practice, where special challenges are encountered because of the number and variety of patients served. It is the first line of interaction between patients and the health system, and it deals with a wide array of clinical problems, across all ages and socioeconomic groups. For exactly those reasons, family practice might, in time, gain the most from the streamlined processes created through telehealth. Evidence-based care and information on preventive measures, for example, might have its greatest impact at this level of the health system. Today's pioneers are already exploring these opportunities.

Aside from ensuring that physicians have access to the best information available, perhaps the most significant application of the new technologies lies in empowering people to better understand the determinants of their own health. With access to high-quality and easy-to-use information, Canadians can take charge of their own health and make better informed decisions on how best to maintain it. Examples might include making lifestyle changes through diet and exercise programs, or learning how to live with a chronic condition in a way that maximizes quality of life.

Consumers are already demanding more and better sources of information on health topics, with the Internet's World Wide Web being used increasingly as the dissemination tool for such information. Among the pioneering activities of this sort, major sites on arthritis and lupus have already been created in Canada, and one specializing in advice on women's health is under development. Many similar web sites in other areas of health of concern to Canadians are either being planned or developed across the country.

3.0 Public and Private Sector Contributions

Many of the pilot projects presented at the conference reflected needs for particular application areas. To take these projects to the next level will require two broad thrusts: first, the development of policy frameworks by provincial and federal governments in ways that will accelerate the development of telehealth systems in Canada; and second, the commercialization of the expertise developed in these projects into viable products and services for Canadian and foreign markets.

Both private and public sector will play a role in the development of telehealth in Canada. The public sector is the primary payer for health services in Canada, with a market that amounts to well over $70 billion per year. Thus, the public sector is clearly responsible for establishing the frameworks for implementation of telehealth in Canada. Indeed, the provincial and federal frameworks, properly designed, can have a significant effect in accelerating the introduction of telehealth, for example through eliminating policies that prevent billing for remote teleconsultations.

3.1 Provincial Frameworks for Telehealth

To some extent, provincial governments are already taking steps in implementing health information and telehealth systems in their own jurisdictions. The first two from New Brunswick and Ontario were reported at the conference in detail, while other provincial initiatives were identified through reports and personal contact.

- New Brunswick is increasingly using networking technologies to enhance the efficiency and effectiveness of managing and delivering services, and has identified telehealth as one of five key investment and trade sector priorities. A provincial Telemedicine Coordinating Committee has been created, and a Hospital Corporation Information Technology Forum is currently developing a strategic information and ICT plan. Success indicators are based on demonstrating that telehealth improves health outcomes, increases access to health services, results in service delivery at the same or less cost, generates a high level of patient and provider satisfaction, and facilitates administrative management of the system.

- The Ontario Smart System is guided by a vision of providing "the right information to the right person at the right time to meet the care delivery, deployment, management

and social objectives of the provincial health care program. Coordinating the system is a Program Management Office (PMO), which includes as partners the Ontario Health Providers Alliance, the Information Technology Alliance of Canada, and the Ontario Ministry of Health. Over the next ten months, the PMO will be developing a governance structure for the Smart System, a high level architecture, and initial standards to be followed by vendors developing products for the system. Key areas of investigation include: computerizing the office of the physician; creating a universal drug health network; supporting the networking of laboratory activities; creating an electronic patient record; and, encouraging the use of remote consultations.

- Via a contract with SmartHealth, the Manitoba Health Information Network is under development and will link authorized health care professionals at defined points of access to health information. Draft privacy legislation concerning health information was introduced in the Spring of 1997. Manitoba also has a Drug Program Information Network and a Home Care Project.

- The Saskatchewan Health Information Network is based around a province-wide health information network linking the various districts and their health care facilities.

- The recently established Newfoundland & Labrador Centre for Health Information (NLCHI) will create an integrated and comprehensive information technology system for health and social services. Coordinating health information and databases will assist government, health providers, consumers and special interest groups in making more informed decisions about health and health care.

- PEI's Island Health Information System connects over 1000 users at 40 sites where health care delivery and administration occur. In the acute care facilities, applications have been implemented in: admission/discharge/transfer; institutional pharmacy; medical records; and, clinical scheduling. The next phase will expand the network to include physicians and pharmacists.

- The Home Care Nova Scotia program, based on the Manitoba program, will allow remote communications between home care coordinators and a central server in Halifax, linking to the provincial health card master file and demographic, diagnostic and socioeconomic information about the patient.

- Quebec will be holding a Request for Proposals for the implementation of a health and telecommunications network, and is reviewing the uses, economics and health outcomes of “smart cards” that contain elements of patient medical files.

- British Columbia's Healthnet/BC is a province-wide technology infrastructure, based on Internet standards, allowing stakeholders to provide a variety of health services, including PharmaNet and an Organ Donor Registry.

- Alberta is taking on a province-wide health information management and technology initiative and has established a Senior Reference Committee and Technical Co-ordinating Group. An industry alliance has also been created and the Health Information Protection Act is undergoing public scrutiny and consultation. The Telehealth Working Committee is currently generating a strategic and business plan.

3.2 Opportunities at the Federal Level

The breadth and depth of telehealth experiments and developments at the provincial level across Canada is certainly a positive development for the country. Such activity will in time lead to a solid foundation for future telehealth services. It also raises the question, however, whether there are areas where duplication of experimentation and effort might be unnecessary, or whether there are possible synergies that could be achieved through cooperation, or whether the adoption of common approaches or standards might be to everyone's advantage. These questions provide one focal point for a national telehealth strategy.

The second focal point is found in the development of Canada's telehealth industry. Without a strong Canadian private sector presence in telehealth, required products and services will be supplied by foreign companies, and Canadians will become consumers, but not producers, in this new market. Only if Canada can develop a strong industry sector to supply the domestic market can we hope to compete in international markets as other countries implement their own health information infrastructures.

Specific federal programs and initiatives responding to these two key requirements include the following:

- The 1997 Federal Budget provided $50 million over three years for Health Canada to lead the development of a *Canadian Health Information System* (more detail on the CHIS is provided in Appendix 3).

- Also in the 1997 Budget, a new, three year, $150 million *Health Transition Fund* will test and evaluate models for reforming and modernizing the health care system. The Fund will consider specific projects in such areas as

pharmacare, home care, primary care, preventive health and evidence-based decision-making.

- Developing useful applications is ultimately the key to the Health Iway. Much experimentation will be required to see what does and does not work, and what can be afforded in the current fiscal environment. To assess the state of Canadian suppliers for the telehealth market, Industry Canada has recently completed a review of the opportunities facing and the competitiveness of companies in this area (see Appendix 2).

- The *CA*Net II* initiative, being led by CANARIE, is developing a quasi-production network for the development and testing of applications for the next generation of broadband networks. This infrastructure will allow eligible institutions to demonstrate prototype suites of applications for a Health Iway.

- The new *Canadian Foundation for Innovation* addresses the creation of knowledge infrastructure, including upgrades to research equipment in our universities and R&D institutes. Databases, information technology, and connectivity to CA*net II are among the eligible costs to be considered by the Foundation.

- The *Networks of Centres of Excellence* (NCE) Program brings together researchers from universities, institutes and industrial labs. Six Networks are involved in health, including the Respiratory Health Network and the Neuroscience Network. Using ICT to bring researchers together, the Health Evidence Application and Linkage Network (HEALNet) is a multidisciplinary research project, addressing the health of Canadians and the efficiency of the health care system. HEALNet creates alliances with knowledge-based industries to develop, test and market the products that will lead to better health care decisions for Canadians.

- Canada will also continue to collaborate with our international partners. To date, nine projects have been undertaken as part of the G7 Industry Ministers agreement in 1995. Areas covered include a global public health network; data cards; a multilingual, anatomical database; enabling mechanisms; and emergency telehealth. The G7 will also be staging four theme workshops beginning in Spring 1998 to discuss: interoperability and standards; evaluation and cost-effectiveness; medical legal issues; and impact on health care management.

All of the elements for telehealth in Canada are already present - - experience and expertise, a nascent industry, provincial frameworks in development, and the pieces of a federal strategy. By taking these elements together as a whole, Canada has a tremendous opportunity to build a Health Iway that meets the health needs of Canadians, and establishes us as world leaders.

4.0 Challenges on the Road Ahead

The expansion of telehealth services poses many technological and policy challenges. The technology must be user-friendly, but must also be secure. Canadians must be able to trust the integrity of the system to maintain their privacy and the confidentiality of their health information. Public policy makers must be open to sharing information and ideas, both about what works and about what does not work. We must learn more about how to change our organizations in response to technological change and a growing base of health knowledge and evidence.

Our understanding of some of these challenges and how to respond to them is still at an early stage. Nonetheless, we are gradually developing a sense of what the primary challenges are, and what some of the initial steps towards a solution might be (more detailed information on some of these challenges appears in Appendix 4).

4.1 Costs and Benefits -- From Pilot to Permanent

In each of the teleconsultation pilot studies, the issue of permanency of funding once the pilot is finished is a serious concern. If telehealth systems are to be viable in practice, they must pay for themselves. Demonstration projects can sort out the advantages and disadvantages of using the technology, but once the trial is over, any new system must be able to justify its costs. However, who bears the cost and who makes the savings are pressing questions for the evaluation of telehealth benefits

Much of the savings for remote teleconsultations and continuing medical education (CME) result from reduction or elimination of travel costs. Costs of transportation and accommodation, plus the forgone income of the traveler, are the primary areas of saving. However, for a telehealth clinical visit, most of the savings go to the family, while the

public system bears the cost of putting the technology into place. On the other hand, universal implementation may be justified on other grounds, as people in rural and remote areas are already disadvantaged with regard to health service.

Part of the solution to this dilemma might come from reducing the cost of telehealth infrastructure through finding *economies of scope*: multiple applications using the same infrastructure, each contributing a portion of the overall cost of the system. One example of this is the sharing of network infrastructure for both remote teleconsultations and CME. This example also raises the possibility of external sources of infrastructure funding. Sponsors of CME, such as pharmaceutical companies, might be able to assist in covering the costs of infrastructure that is used for both CME and other telehealth applications.

Savings resulting from reduced travel costs are a function of both distance and volume. For remote telehealth services, savings are much larger for each patient served, but in most cases the volume is relatively low. In an urban setting, however, a small saving per patient may lead to greater overall savings because of the higher volume. It may be that telehealth infrastructure shared between remote and urban services might provide an optimal return for the system.

4.2 Challenges and Opportunities for Physicians

Health care has always been a knowledge-based activity. Traditionally, this has meant that physicians have acted as custodians of highly specialized knowledge. Their training has emphasized the absorption of large quantities of information, but it has placed even greater emphasis on the development of an understanding of the broader context of health and of how to use available information and tools properly to best meet the health needs of the patient.

The Health Iway is expanding the scope of access to information. Already, patients are becoming empowered by seeking out information on health matters, and increasingly arrive at their doctors' offices armed with relevant statistics and facts. Converting improved access to information into improved understanding of health, however, is one of the key opportunities and challenges of telehealth.

For physicians, telecommunications is already pushing the frontiers of CME. The *National Forum on CME*, which began in late 1996, brings together the major stakeholders in Canadian medicine, with the goal of fostering "collaborative leadership in order to encourage effective CME in Canada." The Forum has undertaken a review of the

Canadian literature, and the activities and initiatives of member organizations, to determine the state of CME in Canada.

HEALNet's Education and Knowledge Transfer Program is examining the potential of networks to build education modules into decision-making tools, and to provide customized training to individual physicians. There are also different (though overlapping) training needs to accommodate health care practitioners, informatics support, administration and policy makers to ensure that telehealth-focused education is effective.

Ideally, health professionals will become model users of telehealth-related technologies, and many projects are underway to explore how best to accelerate deployment. As in other fields, successful deployment requires a recognition of the daily realities of the health professionals involved. Family physicians, for example, must remain focused on immediate concerns relating to their patients, and often face practical constraints in adopting a technology whose benefits may be longer term. Of particular concern are economic considerations, which include equipment and upkeep costs, as well as training costs for both physicians and their staff.

The involvement of physicians in the collection of information for research and other purposes also poses special challenges. Among these is the need to ensure that records maintained to support future research are accurate and complete. Given the pressures of family practice, where much of this information must be collected, special incentives may be necessary, as often the structure of record keeping in the physician's office must change to reflect electronic formats. A related consideration, that many projects of this sort encounter, is the need to digitize archived records, which involves additional costs.

In general, as plans are being developed for projects that involve physicians, it is appropriate to involve those affected from the outset. This helps to ensure that fears of outside interference and concerns regarding the definition of guidelines and about potential breaches in privacy and confidentiality are addressed.

4.3 Ethical, Legal and Social Issues

The ability of networks to enable the many stakeholders of the health system to interact in new ways raises a number of unprecedented ethical, legal and social issues, or ELSIs for short. ELSIs appear at every level of interaction in the health system, affecting individuals in some instances, and our entire society in others. Some are simple and easy to manage, while others are very complex. Poorly managed, ELSIs have the potential to affect the

viability of a networking project, and could even disturb the basic values of an institution or profession.

New interactions among the participants in a project may cause ELSI-related conflicts at several levels of the system. Some might arise as incompatible objectives, for example between requirements for researchers and those for administrators. Social and scientific controversies will also play a role.

A variety of issues surrounding the relationship between physician and patient also need resolution. Networks raise issues of medical responsibility, such as ensuring that the treating physician remains responsible for the patient, and, similarly, that consultants are liable for their opinions. Traditional concerns also remain, such as informed consent to ensure that the patient understands the procedure being recommended, and that proper, signed consent is obtained. Reimbursement and licensing issues across jurisdictional boundaries, and granting of full privileges at the remote hospital, are of concern to those involved in remote consultation. Even name changes, as the result of marriage or divorce, can pose difficulties with medical records if they are not addressed from the outset in the design of the system.

The *Centre for Bioethics* at the Clinical Research Institute of Montreal is studying the range of ELSIs encountered by telehealth initiatives. They note that project managers are generally not equipped to deal with ELSI issues, and so they are developing management guides for them. The Centre is also developing a Telehealth ELSIs Observatory, to go online in Fall of 1997, to keep telehealth researchers, project designers and managers in touch with related technological and social developments, and to keep the ELSIs guides up to date.

4.4 Privacy, Confidentiality and Security

Privacy, confidentiality and security are among the most pressing concerns of Canadian citizens as the knowledge-based economy and society emerge. These issues are of special importance in the field of health, where protecting personal information related to health status, ensuring traditional doctor-patient confidentiality in telehealth sessions, and safeguarding the networks that connect the parts of the health system have to be given special priority.

There is no single way to address these concerns. Partial answers are found in new technologies, but new legislation and regulation may also be required, and new protocols

and guidelines for practitioners may be needed. While progress is being made in each area, currently no comprehensive package of partial solutions yet exists.

Integrating new security technologies into the design of telehealth systems is of particular interest. For access to electronically stored data, sophisticated techniques to identify users and deny unauthorized access is of primary concern. Of even greater significance for many telehealth applications is data encryption, where the adoption of a public key infrastructure (PKI), as detailed at the conference by the *Centre for Health Information Infrastructure* (CHII), holds great promise.

PKI is a physical network and policy framework for sharing secured information[1]. PKI thus addresses the need for:

- privacy of information through encryption;
- authentication of the transmission through digital signatures to verify that the sender is who they claim to be, that the information is not intercepted by a third party (eavesdropping), and to track the flow of the information to the originator;
- ensuring the integrity of the document and that the data has not been tampered with;
- providing the management functions for the above items.

The federal Treasury Board has established standards for PKI. Adoption of a common standard across the provinces and federal government will be necessary to limit the number of keys involved and reduce the cost of implementing the system. Also, a trusted third party must be identified as the Certification Authority.

Technological solutions alone are not enough to ensure privacy and confidentiality on Canada's Health Iway. These solutions must operate in a context of legislation and regulation to be effective. Some provincial governments, such as Quebec, Manitoba and Alberta, have passed or are tabling legislation in this area, and others are sure to follow. Federal legislation is also expected in the next year. Much can also be done in the way

[1] In a PKI system, every person has both a public and private key. The keys themselves are algorithms, with the public key mathematically derived from the private key. If A wants to send a secure document to B, A gets B's public key, which is in the public domain in the trust of a Certification Authority, and encrypts the document, then sends it to B. Once encrypted, B's private key, held only by B, can decrypt the document.

that data is collected, by controlling who has access to which information, and by aggregating data for research purposes in ways that mask individual identities.

4.5 Standards and Interoperability

An effective example of the benefits of standards lies in the Internet, the global network of networks that all use a common suite of protocols. This evolution of these standards, and of the related standards dealing with World Wide Web technology, is one of the greatest achievements in the entire computing and communications field. Having such standards provides a common development platform for a range of new applications, which in turn reduces the risk of investing in new products and systems, and thereby reduces barriers to entry. This has not precluded diversity, however, since a vibrant market in hardware and software still exists.

Standards like this are equally important in telehealth areas, whether for the creation of applications or for the interconnection of systems across provinces. Since provincial frameworks for telehealth systems will in general be independently developed, the question of standards is raised in terms of how provincial networks will be linked together to share certain information. For example, how can information be extracted from differing provincial systems to support research at a national level in the development of evidence-based decision-making tools? Since provinces already have different data classification schemes, which makes data linkages for such studies difficult, there is an urgent need to address this issue. Otherwise, it may become prohibitively expensive to retrofit systems to support broad-based data collection.

The challenge of federal-provincial collaboration in the development of telehealth standards should not be underestimated, but by working together there are legitimate synergies to be captured. For example, the development of linkages among federal and provincial health information sites on the World Wide Web would appear to hold great promise for the eventual definition of a common approach to the provision of health information. The *Canadian Institute for Health Information* (CIHI) is already addressing standards issues related to telehealth, and is collaborating with other standards organizations and the key stakeholders in the field, including the provincial Ministries of Health (see Appendix 4).

4.6 Challenges in Outcomes Evaluation

Dr. Paul Dick, of the Hospital for Sick Children, emphasized the need for a rigorous evaluation of all new telehealth services and applications relative to design objectives, and with a view to possible unintended consequences. Only through a thorough evaluation of the various pilot studies that have been undertaken will a justification for widespread deployment of telehealth systems emerge. Because of the small scale of most pilot studies, the numbers may have to be pooled in some fashion to have statistically significant results. International partnerships may also prove to be of value.

Attention must also be paid to the outcomes of concern in these studies and the development of metrics for those outcomes. The spectrum of outcomes involved is very broad, including quality of care, access to care, economic costs, and organizational competitiveness. Health-related outcomes can include disease-specific results, such as improvement in clinical symptoms or signs, or to generic results, such as impact on overall quality of health and life. Process-related outcomes include utilization of the service, technical performance, impact on decision-making, presence of adverse effects and degree of patient and physician satisfaction. Finally, the human, non-technical aspects of telehealth are also critical, and are as likely to play a role in the success or failure of telehealth projects and implementation as the technology itself.

5.0 Conclusion

Canada's health care system is changing. In part, this is because provincial governments are trying to control the costs of their health systems; in part, it is because new technologies and applications are presenting alternatives to traditional practices, in some instances alternatives that improve access and quality of care for Canadians as well as reduce costs.

The evolution of telehealth is thus being driven by both fiscal constraints and by rapid changes in information and communications technologies. While pressures in the fiscal areas might ease over time, the rapid evolution of new ICT is likely to continue, with computing power and networking capabilities continuing to double at least every 18 months, and with the application of these new technologies continuing to expand to every sector of the economy and society.

Ultimately, in the face of such relentless growth in technological capability, and such widespread utilization of the new technology, almost everything must change. In the health sector, this means not only the way in which knowledge of best practices and the techniques and therapies for treatment is collected and shared, but also the organization of the system itself. Over time, and with constant innovation and experimentation, the respective roles of different institutions and different health professionals must change to best leverage the power offered by the new technologies.

At the same time, some researchers suggest that we must not rush to impose a technology on a health situation, but must move at a more measured pace, implementing only the most appropriate technology and ensuring that we "get it right." Technologies and solutions must be chosen that best improve quality of care, not that best illustrate purely technological virtues. Thus, a multimedia, broadband communication system may not always be needed to support telehealth applications, although in some cases it certainly will be. Nor should we rush to eliminate face-to-face encounters between physicians and patients simply because the technology to do so is available and is found optimal for certain situations. Traditional encounters may continue to be standard practice for a great majority of interactions with health practitioners, though they will surely be enhanced by better diagnostic tools on the practitioner's desktop, and by a knowledge base derived from extensive evidence-based research.

The *Telehealth in Canada* conference began with a series of questions focusing on the experiences gained across the country and addressing the need to develop a consensus regarding which telehealth technologies and practices improve outcomes and quality of

care, which ones are effective and economical, and which ones are not. The consensus at this point is that telehealth is still in its infancy, and definitive answers to these questions is some way off. We know already that under particular circumstances -- certain conditions, situations, patients and physicians -- telehealth does improve both access to and quality of care, and that in certain situations it also reduces cost. We also know that no matter how powerful the technology, it must be implemented with full appreciation of the social and emotional factors that inevitably come into play when humans are involved, or else it will fail to produce the desired benefits.

As reflected in the papers presented at the conference, Canada is developing considerable experience with telehealth technologies and applications. Through continuing to share experiences and learn the lessons of our colleagues, through courageous innovation and deployment of new systems, through aggressively addressing the complex legal, social and policy issues involved, Canadians have an opportunity to become world leaders in adapting the new information and communications technologies to the improvement of health systems. The dreaming stage is over, the time for action is now.

APPENDIX 1: Breadth of Canadian Experiences

1. Remote Teleconsultations and Continuing Medical Education

The original connotations of the word "telehealth" lie in the use of telecommunications to provide health services at a distance. Eliminating distances is still a central theme of telehealth for remote teleconsultations, that provide access for people in rural and remote areas to specialists who may reside in a major centre. Both patients and local physicians benefit from timely advice from experts, but without the time and financial costs that must be incurred for travel.

Continuing medical education (CME), in the context of telehealth, is about using networks to upgrade skills of doctors. Grouping remote teleconsultations and CME together may seem to be an odd combination, but from a practical point of view, the two are inevitably linked. Because both applications can easily use the same network infrastructure once established, together they can share the cost of implementing the system.

1.1 Hospital for Sick Children

Consistent with the Hospital for Sick Children's philosophy of being "an institution without walls", telecommunications and computing technologies are being applied to create "video clinics" for consultations with children far away from Toronto. In a pilot study, 115 clinic visits were made by 84 patients, mostly in Thunder Bay, to a specialist in Toronto. Over an ISDN line[2], X-ray images and MRI scans can be transmitted to a specialist at the Hospital for analysis.

Both physicians and patients reported high degrees of satisfaction. Little difficulty was found in providing information to the specialist, and as patient and doctor became more familiar with the technology, the level of comfort generally increased. For families, the biggest advantage was saving the cost of a trip to Toronto, including forgone income from time spent away from work, for what turned out to be an average 23-minute appointment. The HSC estimates that the average family saved $1222 through teleconsultation rather than a traditional in-person appointment.

1.2 Nova Scotia Rural Physician Network

[2] ISDN stands for Integrated Services Digital Network, a digital transmission standard.

During 1996, the Nova Scotia Department of Health conducted a 12-month pilot project, connecting Halifax to 4 rural sites. PC-based videoconferencing was used for CME, and for consultations in radiology and dermatology. As a measure of the project's success, the next provincial budget will provide funding to most of the hospitals in Nova Scotia to be equipped with these tools.

Teleconsultations demonstrated the effectiveness and speed of networking technologies. For radiology applications, the turn-around time for analysis of images was reduced from 2-3 days under physical transport, to same-day service for regular situations, and immediately for urgent situations. Dermatology consultations also proved to be a success, despite perceptions that they would require more in-person contact. More importantly, the accuracy of the remote consultation was similar to that of in-person consultations. All 66 patients indicated a preference for remote consultations. Dr. Dan Reid, of Nova Scotia Health, also felt that recent graduates are more comfortable being located in rural areas, with technology as a back-up when support cannot be there in-person.

1.3 Child Telepsychiatry Project

With a budget of only $38,000 for Phase 1, the Child Telepsychiatry Project addressed the lack of child psychiatrists in rural regions of Newfoundland. 23 patients were involved in the randomized control study, which compared telehealth interviews with face-to-face interviews. An independent evaluator for Phase 1 found that in 22 of 23 cases, the diagnosis was the same as in a face-to-face situation. While psychiatrists generally had a preference for in-person contact, they were satisfied with the results. Both parents and children were content to have the appointment done remotely. Some technical problems arose, but it was felt that these could be easily overcome with better equipment. Dr. Rod Elford, who coordinated the project, noted that this system would not be appropriate in certain instances, such as dealing with depressed teenagers, or in emergency situations. One noted effect of a videoconference is that the system can potentially magnify the feeling of distance, a sensitive issue for a psychiatric consultation. Phase 2 of the Project is now underway, linking the Children's Hospital in St. John's to a hospital across the island, and will include a cost analysis.

1.4 Rural-Urban Telehealth in Alberta

Health care providers at one rural site in Alberta consulted specialists and subspecialists at a tertiary care centre for a period of ten months, via the use of a 24-hour real-time telehealth system. A total of 55 encounters (42 clinical; 13 non-clinical) took place. This efficacy study evaluated the acceptability of telehealth by all users. The telehealth opportunity was reported to impact positively on access; on diagnostic, investigative and management decisions; on patient and physician travel times; on professional and educational opportunities; and on overall patient health status. Both patients and nurses rated telehealth consultations more highly than traditional consultations. Physicians preferred the traditional approach on average, although voiced advantages and satisfaction with telehealth opportunities. Estimates of cost savings were $14,486 for 42 patient consultations.

This pilot builds on three years of experience using telehealth systems in Alberta, and sets the stage for future projects. Drumheller is one of 17 regions developing a business plan for telehealth. Putting the networks in place to provide service to the 17 regions is being planned as part of a province-wide Information Management/Information Technology telehealth plan.

1.5 Quebec Inter-regional Telemedicine Network

Phase 1 of this pilot project began in September 1996 using a videoconferencing system over ISDN to conduct biweekly CME and multidisciplinary staff meetings. Some technical and social hurdles played a role at this early stage, including multipoint distribution, inability for more than one person to speak at once, limits to spontaneity, and adjustments necessary for effective interaction with the system. Still, most of the doctors endorsed the quality of medical content, and felt that overall the system was a superior way of getting CME. The major benefit for doctors taking CME was elimination of travel costs, without the need to find a replacement during absence. Phase 2 began in March 1997, adding teleconsultations as an application, and will continue until March 1998.

1.6 Satellite Broadband Networks for Cardiac Consultation

The University of Ottawa Heart Institute has recently initiated a project to use satellite ATM technology[3] to transmit diagnostic information from remote areas, so that a specialist can carry out comprehensive consultations. The aim is to show that telehealth is a viable alternative for delivering health care in Canada, to improve access to health services in Ontario, and to increase the efficiency of service delivery. The $4.9 million project will produce remote satellite consultation workstations, remote consultation software, in addition to evaluation studies on cost and educational aspects.

1.7 TeleInViVo

TeleInViVo is an application for "collaborative volume visualization", enabling communication of multimedia data between a remote site and a base station. This application was tested by the US Army in Bosnia, using a 38-kg package in the field which allowed image transmission and videoconferencing, for remote diagnosis. TeleInViVo allows non-trained persons to scan patients in a remote location with an ultrasonic scanner, thus affording critical emergency medical information previously unavailable. This will provide emergency medical personnel with life saving information anywhere on earth.

1.8 Design Considerations

Design and ergonomic considerations for telehealth workstations and buildings will be increasingly important as technologies mature, and will be critical to acceptance of telehealth by the health community, who require sensibly designed and easy-to-use tools that enhance performance. Design is a new frontier, just taking hold in the computer industry. Poor design can be a problem in integrated systems, causing attention to be taken away from the medical task at hand, toward things like tripping over the loose wires of one's equipment. Without proper ergonomic consideration, multiple pieces of equipment may be a nuisance, causing serious problems for comfort and efficiency.

By working through the principle of fitting technology to humans, rather than the other

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[3] ATM stands for Asynchronous Transfer Mode, a data transmission technology based on moving information across the network in small "cells".

way around, specialized workstations for telehealth are being designed to function as one integrated piece of furniture rather than assorted components of equipment. Also being designed is the Distance Diagnostic Unit, a mobile, modular, prewired building which can be "air-dropped" to provide telehealth services to remote areas, especially frontier communities and disaster sites.

2. Emergency Situations

Emergency situations provide a critical test for remote telehealth systems. Because of the stringent requirements for this area, if telehealth systems can be successfully implemented in these circumstances, they can easily be more broadly applied. The health system also stands to lower costs through efficiency gains in handling these situations. Jocelyne Picot notes that Quebec alone spends $30 million per year on emergency patient transport by air ambulance.[4]

2.1 Prehospital Emergency Service

The Prehospital Emergency Service project in Quebec is engaging networking technologies throughout the critical time period from a 911 call through to arrival at the hospital. The goal is to provide superior initial care to reduce the mortality of critical patients. At the same time, the system aims to effectively use the knowledge of remotely located medical control, while enhancing the efficiency of system resources.

The project aims to establish an emergency dispatch centre that links ambulances, directing them to the most appropriate care facility. It will also create a telehealth link from the ambulance to the hospital, with live data transmissions on blood pressure, heart rhythm, EKG and pulse oxymetry; the dispatch centre will also be able to facilitate screening for specific problems, like cerebrovascular accidents and acute myocardial infarction.

2.2 Emergency Medicine in Alberta

[4] Picot (1997), "The Telehealth Industry in Canada: Part 1 -- Overview and Prospects"

Foothills General Provincial Hospital in Alberta has also addressed emergency applications of telehealth. This pilot project assessed the scope for emergency medicine, identifying situations where it is effective and determining whether it is cost-efficient. In 26% of the cases, a transfer of the patient to a major centre would have been avoided had telehealth been available. The most successful areas of applicability being trauma, C-spine fractures and drug overdoses. Both video and X-Ray transmission were important components of an effective remote consultation system.

By their own measurements, transfer savings alone amount to some $40,000 per year -- a cost-effective implementation (ten-year payback) if the infrastructure is also used for CME and other consultations. However, higher system savings (and shorter payback) were expected over time due to: increased confidence; fewer patient transfers; better management of the patient in the local community; and decreased travel time for both physicians and patients. Dr. Ross Male of Foothills also felt that these systems would make it easier to recruit and retain rural physicians, and would improve physician access to CME, based on focus group research in the project.

3. New Tools for Health Care Practitioners

Because of the number and variety of patients, family practice poses many challenges to computerization, yet for the same reasons, has perhaps the most to gain from streamlined processes. Family practice is the first line of interaction with the health system, dealing with a vast array of clinical problems, across age and socioeconomic groups. At this primary level of contact, social and family problems play a key role, and information on preventative measures can have its highest productive impact.

Information management tools are critical, particularly in an age of real-time communications and information overload, coupled with the need for enhanced accountability and predictability of costs. However, computerizing patient records is not enough; work processes must be redesigned around the capabilities of the technology. ICT is a valuable resource that can assist in making informed decisions for the planning and support of high quality health care.

3.1 College of Family Physicians of Canada

The College of Family Physicians of Canada is actively investigating the opportunities and challenges of implementing IT into family practice. The CFPC's Clinical Practice Management Network (CPMN) has been designed to address the needs of family physicians, by providing them with powerful information management tools to allow family physicians to participate proactively in health care restructuring. The CPMN is seeking to: build a computerized patient record; validate and disseminate computerized and evidence-based clinical practice guidelines and other forms of CME; collect family medicine data for different kinds of primary care research; and, establish a national network of family physicians for information and communications purposes.

The CFPC is also designing a Clinical Management System (CMS), an integrated suite of applications to support physicians in streamlining administrative and clerical activities in their practices, such as billing, referrals and scheduling. The CMS, which will be available in Fall 1997, is designed around the way a physician spends their day, capturing the subtleties of patient-doctor interactions, and facilitating the physician's role as patient advocate, educator and health care coordinator. The CMS provides a "summary sheet", a quick snapshot of the patient to identify clinical events that need attention, and to plan callbacks to optimize patient care for those at risk. It also has a drug information and advisor function, and acts as a decision-support tool.

3.2 The Medical Office of the Twenty-first Century

Drug interaction problems arise when a patient uses multiple drugs that may interact with each other in ways that are negative for the patient. For example, certain patients have allergic reactions to certain medications, as is fairly common with penicillin. In other cases, prescription drugs can exacerbate existing conditions, such as asthma. Use of networking technologies can prevent negative outcomes that arise from these types of situations, particularly where a patient may be seeing more than one physician.

110 physicians in Montreal are participating in the Medical Office of the Twenty-first Century (MOXXI), a pilot project based around "expert prescribing system software." The software identifies current patient medications, reviews new prescriptions for potential problems and suggests alternatives where necessary. In the future, this could be supplemented by linkages to other information sources, such as: clinical information; evidence-based guidelines; patient education materials; on-line literature and journals; and, office management tools.

While the potential benefits are huge, several implementation challenges arose at this early stage. A major challenge in this move to a networked environment is the conversion of five years of paper charts into electronic form, a very costly process encountered in many digitization projects. Technical problems also highlighted the need for informatics support generally, and customer support from the vendor. Finally, over the counter or non-prescription alternative therapeutic drugs cannot be easily tracked by the system and could pose a problem.

3.3 HEALNet Primary Care Network Project

HEALNet is also playing a role in aiding the transition to a networked world for primary care. They are assembling a network of physicians from seven participating regional networks across Canada, with an initial focus on evidence-based prevention in primary care. A preliminary assessment addressed physicians readiness for use of ICT in family practice. Across the network, some 85-95% have a computer, 68% have modems, and 30% have Internet access. Currently, computers are primarily used for billing and administrative tasks, not for advanced features such as diagnosis and consultation. The survey also notes the importance of developing application interfaces that are simple and user-friendly.

4. Connections and Integration

Telehealth is also about using the tools of ICT to create intelligent connections, leveraging the power of networks to enhance the efficiency and effectiveness of the task at hand, whether connecting hospitals or health centres, aiding home care, or providing high quality information on-line.

4.1 Network Capabilities

In a keynote address, Dr. John Silva, a surgical oncologist and specialist in medical informatics with the United States Defense Advanced Research Projects Agency, shared his vision of “knowledge-based, web-enabled, networking teams” that operate with a technological base of powerful, networked applications, independent of time and place. At the network level, applications must operate over a network service layer of “middleware” that enables the network transactions to take place in an efficient manner. One element of this is “electronic commerce” transactions processing to accommodate

billing and payment, authentication and security, privacy, file transfer authorization and integrity functions. A second service element is the use of digital libraries, the information storage and management component of the network. This would also include agents and brokers to find, filter and process the information, and intellectual property management schemes.

These elements allow for robust applications based on two key principles: "just-in-time" information, as in modern production processes; and information that is "just what is required" for the purpose at hand. Technologies to achieve the latter are currently unavailable. Also, "push" technologies[5] can be advantageous for telehealth networks, sending information as it is gathered to a database, to a specialist or pharmacist, or to the patient's home physician.

4.2 HealthLink

At a time of downsizing in the health sector, the need for integrated health systems has become all the more important. HealthLink connects 20 health institutions in Ontario, including seven hospitals and a number of home care sites. Initially, the project took a clinical focus, looking at clinical data exchange for perinatology (now fully on-line), and oncology. Key application areas for physicians include: electronic storage of clinician's notes in charts; access to radiology images and reports; links to laboratory results and drugs administered; and patient demographics. Rhonda Wilson of HealthLink felt that having a formal governance model was an important element, as theirs took 2 years to put into place.

4.3 Integration in New Brunswick

New Brunswick has made IT readiness a priority, reflected in its deployment of a 100% digital network across the province, and in an aggressive development plan for a broadband ATM network by 2 carriers in the province. Since 1993, 12 hospitals have been linked into a 36-room multipoint videoconference network, used for administrative meetings, education courses and clinical consultations. Because hospitals own the

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[5]"Push" technologies allow information to be sent directly to a recipient, based on the recipient's preset criteria, for example news items on international health networking initiatives. This relatively new development contrasts with the "traditional" Web, where users seek out and find, or "pull", information themselves.

videoconference units, they are able to generate additional revenue by renting them out. Also, hospitals, health centres and a growing number of physician's offices are linked into the "Wellness Network", a private and secure health care network. The province has been successful as a test bed environment for leading edge telehealth initiatives, including direct radiography and client server hospital information systems. Teleradiology linkages are present in half of all regional Hospital Corporations and the province has implemented a province-wide telephone triage system.

4.4 Clinical Testing Networking

EQuAlity is a new external quality assurance system that will network clinical laboratories across Canada and facilitate the standardization of their testing systems. EQuAlity, which has security measures incorporated within it, will enhance the precision and accuracy of testing procedures within the network. Currently, clinical laboratories in Western Canada are monitored on a regular basis by this program as a part of their licensing requirements. The current system is moving to the Internet so laboratories can link directly to EQuAlity and move towards standardization.

4.5 Networking in the Home Care Context

The SISMAD system, designed by Artefact Informatique, will provide operational support for home care in more than 160 sites in Quebec. SISMAD optimizes clerical and administrative work to enhance the logistical efficiency of home care. Five modules provide powerful support tools for home care personnel: user registration and orientation; biopsychosocial evaluation; the intervention plan; scheduling and planning; and, follow-up health services.

One of the main advantages of the system is to allow the personnel to remotely access and update, with a Personal Digital Assistant, clinical information (vital signs, medication, progress report, etc.), as well as operational/administrative information (schedules, expense reports, etc.). This helps to make the right information available at the right time to each person involved in a specific case of home care services.

4.6 A Community Health Information Network for the Next Century

IntelliCHIN is a vision for the next generation Community Health Information Network. It is based on a self-funded, shareable Electronic Patient Record (EPR), a comprehensive health information resource, and on-line professional services. The Medi-Net Patient Management System, developed by MNI Systems Corporation of Mississauga, responds to the current environment of services, which are not well integrated across different care providers, government agencies, hospitals, academic centres and product and service suppliers. For example, 80 % of a patient's lifetime longitudinal record resides at the family physician's office, while the other 20 % typically rest in institutions. Currently in the launch phase, the Medi-Net System is scalable to become a nation-wide IntelliCHIN network, linking the entire system at local and broader health community levels, while providing authorized access to a shareable EPR within a private, secure and neutral environment.

4.7 Health Content on the World Wide Web

Open networks of information can be a valuable tool for empowering of people, whether they are interested in researching a particular condition, or whether they are simply interested in information about how to live healthier lifestyles. People are already demanding more and better sources of information on the health topics of interest to them. This serves to improve overall health outcomes. Indeed, providing high quality information can be a preemptive strike against falling ill in the first place.

The Internet is increasingly being used as an easily accessible dissemination tool for health information. One Conference demonstration, LupusNet, is an information resource on the World Wide Web for people afflicted by lupus. Arthritis Canada is the electronic home to The Arthritis Society, the Canadian Rheumatology Association and other arthritis health care providers. Visitors can find up-to-date information on a broad range of topics including research, exercise, medication, surgery, complementary therapies and much more. For those living with this ailment, there is plenty of opportunity to learn about the Society's programs and resources and to interact with others facing the same challenges of the disease.

The Canadian Women’s Health Network (CWHN) is a Partner in Health Canada's Centre of Excellence in Women's Health Research Program, aiming to improve the health status of and services to Canadian women. Part of the CWHN’s mandate is to empower women through user-friendly access to information on women’s health, diagnostic and

preventative. The CWHN is expanding its web site to include an on-line database of groups, organizations, researchers and health information, particularly that concern health determinants and promotion. The site will include links to other relevant sites, selections from their newsletter, information for members, and an "alert" area that will highlight new information and activities.

5. Leveraging Telecommunications Expertise

Canada has a depth of telecommunications expertise manifested in the companies of the Stentor alliance. Through testing and development of many aspects of telehealth systems, these companies are bringing their expertise to bear. In doing so, they provide a major partner for SMEs and health organizations seeking to make the Health Iway vision a reality. The Stentor Innovation Centre provided some examples of this activity:

- NBTel in New Brunswick is conducting a trial of direct radiography in association with the Atlantic Health Sciences Association and Sterling Diagnostic Imaging. This technology displays x-rays, MRI scans and other information on computer screens rather than film. The results have been so promising, this capability will likely be deployed throughout New Brunswick sometime this year.

- BC TEL is currently upgrading its existing HIS patient care applications at the Vancouver General Hospital. The resulting local network will host multiple institutions and could soon be rolled out to other hospitals, regional health boards and the Ministry of Health.

- In Saskatchewan, SaskTel is conducting a Mobile Diagnostic Equipment project to test the effectiveness of an emergency response unit for remote communities. This project uses satellite-based Global Positioning Systems to dispatch ambulances. Through radio communications, it transmits diagnostic information to the nearest hospital at the same time.

- In Alberta, TELUS has played a strong role in the development of the Alberta Integrated Health Information Network (AIHIN). The vision is to successfully assist individuals in achieving health and independence through an integrated network that provides timely, accurate and confidential information. To date, the AIHIN has undertaken a health information proof of concept trial. The current phase is a full-scale practitioner trial to test the feasibility and access of

the AIHIN on a province-wide basis. As of last June, some 200 practitioners from the majority of the 17 health regions in Alberta were participating in this trial.

- In Quebec, Bell Canada is partnering with smaller companies for 18-month experimental project looking at distance education for health. For some time now, Montreal's teaching hospital, H^tel-Dieu, has been organizing semiweekly consultations and seminars in cooperation with regional hospitals in Trois-RiviPres, Joliette and Rouyn-Noranda. The current phase is using ISDN technology to conduct real-time international consultations, enabling quick exchange of test results, radiographs, CAT scans, and other medical images.

APPENDIX 2: A Sector Competitiveness Framework for Telehealth

Jocelyn Picot, author of The *Telehealth Industry in Canada: Part 1 – Overview and Prospects*, presented her findings, as a prelude to release of the report in Summer 1997. Domestic opportunities include integrated networks; home telecare and associated services; telelearning aspects of health; and corporate wellness. In the United States, sources suggest that their market for telehealth will grow from $20 billion in 1995 to $100 billion in 2000.

Several market drivers are influencing the demand for telehealth products, including: new needs presented by an ageing population; pressures for cost-containment; demand for equitable access across geographic areas; availability of increasingly powerful technological tools; consumer demand for health information; and, an exponential increase in medical and health information.

The study is based on many sources, including industry information provided by 112 companies that registered themselves on Industry Canada`s Canadian Company Capabalities database, over 80 interviews conducted with industry and government representatives, and a database of over 70 Canadian projects. The result is a snapshot of an emerging industry, though not a fully comprehensive survey. A difficulty with this exercise is that telehealth represents the convergence of many traditional sectors, such as computers, telecommunications and medical imaging equipment, and so cuts across traditional divides of statistical collection.

Five groups of application areas (though not mutually exclusive) are identified by the study:

- All forms of “medicine at a distance” or remote teleconsultations;
- Inter-institutional, patient and clinical information systems using networks;
- Community and regional health information networks (CHINs), including pharmanets;
- The many forms of health education that can be delivered by networks; and
- Tele-monitoring and care, triage and home care, plus consumer and patient information.

Activity is generally spread fairly equally among the five groups, which is to be expected, since there is a great deal of overlap in the technologies required for each.

The Canadian industry is fragmented, with both very large and very small companies, though not much in-between. Nearly 20% of the companies are very young, and tend to be interested in forming alliances. They tend to have an outward orientation, with 96% of the companies stating that they are exporters. Key challenges facing this small and developing industry include: combatting a lack of established market distribution channels; finding stable sources of financing; acquiring strategic market intelligence; and investing with caution, due to the rapid evolution of technologies for telehealth.

Many companies exist in the area of clinical and computerized patient record software, so there appears to be little room for newcomers in this area. However, there are many opportunities that exist in teleconsultations, home care and consumer markets, though there are a relatively small number of Canadian companies in these markets. There is also a demonstrated need for "turnkey" solutions, but there are very few companies capable of providing such services.

APPENDIX 3: The Canadian Health Information System

The 1997 Federal Budget provides $50 million over three years for Health Canada to lead the development of a Canadian Health Information System (CHIS). Three components make up the federal contribution to this system: health surveillance; population health information; and a health information system for Canada's First Nations.

The *National Health Surveillance Network* will coordinate and share information among the several health surveillance networks in Canada that track incidences and outbreaks of disease. The current system is quite fragmented, with, for example, Canada taking about ten months to report its findings to SalmNet, a network monitoring the occurrence of salmonella cases in 17 countries, compared to an average reporting time of 30 days for other countries. The National Health Surveillance Network will link 400 to 500 institutions, including federal departments and agencies, their provincial counterparts, public health units, regional health authorities, and laboratories. Health professionals will eventually be able to connect to the system. It will provide public health authorities with the means to track potential disease outbreaks more effectively in a real-time environment.

The *National Population Health Clearinghouse* will consolidate information from government departments, provincial/territorial governments and agencies, NGOs and the private sector, will provide access to information on health issues such as substance abuse, family violence and preventive health care. It will also provide information on population life stages, such as childhood and adolescence. The Clearinghouse will support prevention and promotion efforts and help maintain and improve the health of Canadians. The Community Access Program, an Industry Canada initiative, will be one of the major networks used by the Clearinghouse to reach Canadians. This is an area where cooperation among the provincial governments and the federal government can reap significant benefits.

The *First Nations Health Information System* builds on a unique, community-based application, developed in partnership with First Nations and Health Canada's Medical Services Branch. It now consists of 13 integrated subsystems that track information and support case management on a variety of health topics. The system will facilitate health program delivery, management, planning and evaluation, and will be implemented in over 500 First Nations communities across the country.

APPENDIX 4: Challenges

Ethical, Legal and Social Issues

The Centre for Bioethics at the Clinical Research Institute of Montreal is studying the range of ELSIs that telehealth initiatives can expect to encounter, and therefore address beforehand to the greatest extent possible. These include:

- Conflicts between professions and specialties, such as conflicts between doctors and nurses, physicians and pharmacists, and radiologists and nuclear medicine specialists;
- Conflicts between institutions in the health care system, such as incompatible objective between requirements for researchers and those for administrators;
- Social and scientific controversies;
- Inter-regional and inter-institutional differences that require standards to be implemented;
- Appropriate use of information once collected, and incentives for those overworked people who collect information; and,
- Participation in and the openness of the network development process.

From this list, compiled from interviews with 21 managers involved in 15 networking projects, two main conclusions can be drawn. The first is that the more, and more different, stakeholders, services, purposes and missions, the more complex the ELSIs raised. The second is that project managers are generally not adequately equipped to identify, assess, prevent and manage these issues that arise.

In the MOXXI Project noted in Appendix 1, eight ELSIs were identified up to now: professional liability; issues to do with remote access tools; name changes; discovery of an inappropriate prescription by another physician; possible use of patient records in a law suit; patient-physician relations; appropriate level of carefulness on part of monitoring physician; and, development of problematic behaviour in regards to the computer.

Experience in the Quebec Interregional Telemedicine Network adds 4 medico-legal issues, discovered as part of the Network:

- Medical responsibility issues such as ensuring that the treating physician remains responsible for the patient and similarly, that consultants are liable for their opinions. Malpractice issues may need to be reconsidered;

- Informed consent to ensure that the patient understands the procedure being recommended and that proper, signed consent is obtained;

- Confidentiality issues such as avoiding the use of the patient's name, ensuring that telehealth sessions remain private, and that the transmissions are secure;

- Hospital responsibilities, such as providing physicians with full privileges at the remote hospital.

Some unsolved considerations include: licencing across jurisdictional boundaries; malpractice insurance; potential territorial competitive issues; and reimbursement policies. Addressing these will require further study, open discussions with all relevant authorities and cooperation with industry.

Standards

The Transaction Processes Structure Project is addressing the application of ICT to the transaction processes of economic and community activities. The project aims to represent and engage the general public, through measures such as public hearings, to create demand-pull for telehealth. This approach brings in a patient's perspective toward developing a data model for telehealth systems, which can then be accommodated by the technology not the other way around, and also enhances buy-in from the public to the technology.

The Canadian Institute for Health Information is active in standards issues related to telehealth. CIHI has a collaborative approach based on work with other standards organizations and with the key stakeholders in the field, including the Provincial Health Ministries. Six Working Groups were established in Spring 1997 to address the variety of standards issues in the field:

- Health Information Model -- includes the development of a data model and the elements required for an electronic patient record;

- Terminology, Classification and Nomenclatures -- development of health management indicators using standards for classifying data;

- Security, Privacy and Quality -- standards for health information security, privacy and information integrity;

- Information Exchange Protocols -- standards for information exchange, applications and communications protocols;

- Advanced Health Technologies -- standards for advanced technologies such as videoconferencing, document scanning, diagnostic imaging and patient cards;

- Health Identification Systems -- standards for linking provincial health information systems and formation of national health identification cross-reference facility.

There is some overlap between these categories. Where possible, CIHI recognises de facto standards.

Acknowledgements

The *Telehealth in Canada Conference* is part of an ongoing series of activities to accelerate the deployment of a health information infrastructure in Canada. CANARIE would like to thank the following sponsors for their support of the conference and of telehealth in Canada:

Health Canada is engaged in helping the people of Canada maintain and improve their health. This can be achieved in part by the application of information technologies in the health sector to provide a key tool for use and management of health information and knowledge.

Industry Canada has been instrumental in promoting the development of a health information infrastructure and telehealth applications in Canada, through funding of the CANARIE Program, through the creating of the Canadian Information Highway Advisory Council and as a partner in developing CANARIE's Health Iway vision document.

Cifra Medical designs and develops technological solutions for telehealth. Cifra telehealth equipment allows simultaneous transmission of fixed or video images on an Internet-compatible, multimedia platform. Cifra's Mobile Exam Station allows doctors to establish real-time diagnoses for patients located at a distance.

Quebec Telephone has worked with Cifra to establish a telehealth network in Quebec, which allows transmission of cardiology and radiology images across 13 hospitals, ten of which are in Quebec Telephone's territory. In 1996, an information and consultation service was put in place that provides a triage function for first aid cases.

The Royal Bank has a national program for Knowledge-Based Industries, including Life Sciences and Health Care Industries. By recognizing that KBI entrepreneurs have special needs, the Royal Bank provides specialized financing programs and assistance, and work with government, industry, academia and other financial institutions to find solutions for KBI businesses.

AT&T Canada Long Distance Services offers Canadian business and residential callers a variety of products and services for long-distance voice communications, as well as data and message services. AT&T Canada Long Distance Services' superior technology and advanced products are well suited for health applications and use by the health industry.

The Greater Quebec Economic Development Corporation has a mission to promote technological and industrial development in Quebec, including health sciences and related technologies. Quebec resources in telehealth lie in quality research and synergies with the business community to accelerate growth.

The LGS Group is a leading systems integration firm, providing consulting in all aspects of information technology and management. LGS provides technology-based solutions to businesses and governments, and has developed in-depth expertise in Financial Systems, Health Management as well as info-Highway applications and multimedia.

Siemens Electric Ltd. is the sixth largest company in the world in the growing area of electrical engineering and electronics. Medical Engineering is one of the keys to Siemens success, with medical breakthroughs in new procedures and technical innovations.

Le Groupe VidJotron is an international communications company, with Canadian expertise in cable television, telecommunications, television broadcasting and in the development of interactive multimedia services. Its technological know-how acquired with the VidJoway multimedia system and its UK integrated cable/telephony experience enables it to play a leading role in the development of the information highway.

Committees

Telehealth in Canada Conference Organizing Committee

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[1] House and Elford (1996), "Telemedicine Experience in Canada." See http://ume.med.ucalgary.ca/~watanabe/htu/articles/telemedcanada.html