The Keston Group

THE TELEHEALTH INDUSTRY IN CANADA:

INDUSTRY PROFILE AND CAPABILITY ANALYSIS

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by

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FINAL REPORT

EXECUTIVE SUMMARY

This report of the Canadian Telehealth Industry provides an update to the Sector Competitiveness Framework of the Telehealth Industry published 2 years ago by Industry Canada. It is focused on 3 of the five application categories of the telehealth industry: (1) telemedicine, (2) distance continuing medical education and continuing health education and telelearning, and (3) telecare, telemonitoring and call centers. Beginning with a review of the telemedicine activities in Canada and in the world, the report provides information and tables summarizing interviews with 24 Canadian companies, 19 of which are dedicated solely to telehealth business. This information is supported by a review of Canadian government reports and more than 350 articles and material from industry profiles and web sites. An overview of telehealth opportunities and markets is also provided, concentrating on the 3 sub sectors mentioned above. Using as principal sources of information, two recently published reports from Australia and the US, the report outlines one of the newest trends in the industry, arising out of a series of applications assumed under the umbrella title of e-health. Other technological trends, major medico legal and business challenges and issues are discussed. The report provides a review of major strengths and weaknesses of the Canadian telehealth industry and concludes with 11 recommendations designed to assist this small Canadian industry to overcome challenges and barriers and gain greater market shares. In addition to its 46 pages, the report is supported by seven substantial appendices containing original tables, literature reviews and lists of organizations involved in telehealth in Canada and a 14-page bibliography.

INTRODUCTION

This report presents an overview of the present telehealth industry in Canada and the challenges and factors which are affecting the growth of this industry. A departure point for this study is the Sector Competitiveness Framework (SCF) completed for Industry Canada and published in March 1998. In retrospect, many changes have happened since the research undertaken for the SCF. For example, restructuring and reorganization of health care delivery have changed the nature of the organizations, which provide telehealth services. Where regionalization has taken place (Saskatchewan, Alberta) the regions have adopted telehealth as a means of communicating within large regions in order to achieve efficiencies of delivery.

The purchasers of telehealth equipment are now the regional authorities rather than large teaching hospitals and academic centres and, for the most part, telehealth initiatives are less and less regarded as pilot studies. Because of the need to communicate between regions, considerable central influence is exerted on the procurement process to ensure interoperability of the systems that are installed. This is assisted by the fact that industry standards have evolved and, in order to conform, equipment has, perforce, to be less proprietary in design.

Communications infrastructure has also developed remarkably so that fibre optic cables with large bandwidth are increasingly available. That having been said, it must also be recognized that the primary focus of telehealth is to serve rural populations and in most rural regions of Canada the communications infrastructure continues to present a challenge to the deployment of telehealth. There is a considerable disconnect between the quality of telecommunications infrastructure in urban and rural areas.

The increasing penetration of the Internet technologies and services means that increasingly health information is being disseminated via the web. This leads to a more informed consumer who is better able to make his or her own health decisions. The Internet has also afforded health care providers a convenient, inexpensive and friendly means by which to communicate within the system and it is notable that there has been a burgeoning of computer based health care systems that utilize browser interfaces. Video conferencing is moving towards the Internet environment and, as greater bandwidths are becoming available, the performance of live video is becoming increasingly acceptable. The changes mentioned above are largely taking place in the public sector arena, which an overview of the Telehealth activity in Canada demonstrates (see below). Contrary to the results of the research for the SCF report, the public sector is moving more rapidly than before to keep pace with technological change.

Though it is difficult to separate out the public sector and private sector components of the telehealth marketplace, the main focus of this report is the telehealth private industry. Small in number, and also, with some exceptions, small in stature, the structure and content of these companies – selected because they declared themselves to be dedicated to telehealth business - have also undergone major changes since the publication of the SCF. The restructuring is all the more evident because the number of companies is relatively small. Several companies highlighted in the previous SCF have been merged or are no longer active. Others have modified or are completely rethinking their business plans. Some companies which were barely emerging at the time of the SCF are now enjoying modest successes, but others are considering folding and moving on.

It would be an understatement to say that Canadian telehealth companies are falling behind the US and other developed countries in their ability to keep pace with technological change. This could be because there is little r&d taking place, which means innovation is at bay. It could also be due to an important lag in Internet and web uptake (and consequently, e-health) in Canada. New companies have come on the scene, but sadly, they are not made-in-Canada companies. The most successful are enjoying excellent export profiles.

The present study, undertaken for Industry Canada's Life Sciences Branch, highlights these changes which have happened to the telehealth marketplace over the last decade, some of which are outlined above.

In the short time allowed for this study it has not been possible to interview all the telehealth companies mentioned in the 3 targeted categories. It has also been difficult to obtain hard numbers. Several interviewees simply refused to reveal their sales figures. The numbers quoted in this report are taken from self-reported data, and they should be interpreted with caution.

PURPOSE OF THIS REPORT

This report reviews the developments in the telehealth industry since the period just prior to the publication of the Sector Competitiveness Framework (SCF) of the Telehealth Industry, in March 1998.

The objectives of the final report on the telehealth industry are:

- to provide an update of the industry since the publication of the SCF
- to describe, in quantifiable and qualitative terms, the Canadian capacity in the field of telehealth
- to identify the current characteristics of the telehealth industry, limiting the study to for-profit telehealth companies, involved in three agreed-upon areas of applications (listed below)
- to outline current and future activities of the telehealth industry in Canada and discuss some of the characteristics of the marketplace
- to list some of the current trends shaping the telehealth marketplace in Canada and elsewhere
- to outline potential strategies for meeting the present and future challenges

The profile concentrates on Canadian companies dedicated to telehealth along with a restricted, selected number of companies chosen from a list of larger key companies for which a proportion of revenue is derived from telehealth business.

Finally, the report highlights some of the challenges involved in developing the industry, as well as selected recent trends driving change in this small industry.

DEFINITIONS

The telehealth industry profile requires a common understanding of what is meant by telehealth, and what comprises the telehealth industry in Canada. The definition below, used for the SCF report, has been maintained for purposes of this study, but the profile is based on companies which operate in only 3 of the 5 categories of applications originally proposed:

Telehealth is the use of communications and information technology to deliver health and health care services and information over large and small distances. **For purposes of this study** *it was decided that the same broad telehealth definition would be used, but the profile of the telehealth industry would be concentrated on 3 of the applications in the list, that is, private sector companies with activities in:*

Any type of telemedicine (tele-), remote medicine or medicine at a distance*

Applications involving CME and CHE distance education

Applications aimed at patients, particularly home telecare and call centers.

WHAT IS A DEDICATED TELEHEALTH COMPANY

In seeking to identify the Canadian private companies "dedicated to telehealth", this report excludes the public organizations involved, except in the context of describing the market. Also excluded are those large and medium-sized companies which have many clients, private and public, such as medical radiology manufacturers, computer and multi-media firms. In most cases, telehealth revenues represent but a small proportion of their total business. However, it must be emphasized that telehealth installations could not exist without the intervention of medical imaging, computer and communications companies. Because

these companies are key to the telehealth industry, they were originally included in the Telehealth SCF study. Several Tables shown in *Appendix Seven* list some of these as they appeared in databases searched for this profile.

The SCF was based, in part, on information gathered from Canadian companies registered in the Canadian Company Capability (CCC) database. Registration on the CCC database is voluntary, information provided is self-reported, and there are few ways, if any, to verify that the information in the company listing is accurate. The date upon which an update has been made is noted on the profile, but if companies moved, were merged, were acquired, changed names or addresses, changed the nature of their business or product line, became inactive or even went bankrupt, there is no way of automatically making corrections on the CCC database to reflect such changes This is true of practically all of the other databases which were used to obtain information for this report. The telehealth industry is not only very small, it is one in which technological change is ever present, therefore the limitation of self-reported and dated information need to be taken into account when considering the contents of this report.

In view of the restricted number of Canadian companies (most if not all of which are small, privately owned), which are dedicated to telehealth business, it was decided to concentrate the profile on a sample of around 19 companies which are 100% dedicated to telehealth and 5 others considered key telehealth companies though not dedicated to telehealth business. A summary of the interviews is found in *Appendix Four*.

WHAT IS A CANADIAN COMPANY

It should be recognized at the outset that there are very few made-in-Canada telehealth companies. As well, the Canadian telehealth companies are most often either integrators or vendors of technologies developed elsewhere, particularly in the U.S. and Japan, and this fact will be demonstrated in the data presented.

For purposes of this study, any foreign company with operations and employees in Canada, whether undertaking research and development activities, or offering products or services in Canada, or both, is to be considered a Canadian company. Even a small branch office, if reporting revenues to Revenue Canada, and engaged in telehealth activities, is to be considered in this profile if active in one of the 3 categories mentioned above, and meeting the criterion regarding the size of their telehealth revenues.

SOURCES OF INFORMATION AND METHODOLOGY

This report is based on information gathered from the following sources of information:

- Database searches to obtain lists of companies, including US and Canadian sources as well as the CCC database on Industry Canada's web site.

- Internet searches using the key words telehealth, telemedicine, health telematics, health networks, telecare, telemonitoring and companies providing services in those areas. Searches of well known databases for telehealth and telemedicine activities such as Health Canada, CANARIE, the Telemedicine Information Exchange (TIE), the American Telemedicine Association, the Canadian Society of Telehealth and a host of other sites devoted to telehealth applications, health telematics and e-health.

- Searches conducted on Medline and other online sources for literature reviews. *Appendix Two* is a distillation of information drawn from 358 articles, reports and monographs published over the last ten years.

- Study of relevant and current published and unpublished documents from the government of Canada especially, from conference proceedings and documents found on web sites.

- Interviews with representatives of companies selected from the above sources.

- Interviews with government representatives and association executives.

OVERVIEW OF TELEHEALTH ACTIVITY

IN CANADA

To determine the extent of the telehealth activity in Canada, a review of relevant documentation was undertaken, as well as a study of current telehealth activity – sites and projects already in place. The review of the documentation is presented in *Appendix One*. This literature review also serves as a background document with respect to the section on trends and challenges. The information provided below can also be supplemented by *Appendix Six*, which contains an overview of self care and telecare initiatives in Canada, and by *Appendix Seven*, which contains a list of the institutions and organizations involved in telehealth in Canada.

Key telehealth programs in Canada

In the historical context the earliest identifiable telehealth activities in Canada were those undertaken by Newfoundland. Since those early days a number of provinces and territories have implemented relatively wide spread programs and adopted policies that auger well for sustainability of those programs. Many of the remaining jurisdictions have not adopted any formal policies with respect to telehealth with the consequence that telehealth has been implemented on a project-by-project basis and fears are expressed concerning the viability of these projects on a long-term basis. From the perspective of the telehealth industry, those programs that are established represent opportunities for maintenance and growth. However, those opportunities tend to remain limited to the vendors who provided the original equipment because they are, for the most part, single vendor systems and represent a relatively proprietary market. In jurisdictions where telehealth exists as a number of projects rather than an integrated program there is may be an opportunity for vendors to expand their market share. As those jurisdictions adopt a more formal approach it will be necessary to ensure interoperability between systems and, in that context, the opportunities for vendors, other than those already operating in the project environment, may also be limited if connectivity with legacy systems is to be achieved.

Best estimates suggest that there are approximately 250 video conferencing sites in Canada. In addition there is a number of teleradiology sites that have not been included in that total.

A survey of Canada reveals the following activities on-going:

Newfoundland -

As described below, the major component of the Newfoundland network is audio conferencing which is used collaboratively for both medical and educational purposes. Some teleradiology is conducted within the network and video conferencing facilities are also available.

Taken from - http://www.med.mun.ca/telemed/history.htm -

From its beginning as an audio-only teleconference network serving nine communities in Newfoundland and Labrador, Memorial's teleconference system (TCS) has grown into one of the most elaborate systems in North America. The system has grown to meet a need for an effective, cost-efficient communications system to augment health and education services in the province. Its growth was made possible through a series of significant grants from a variety of funding agencies, the efforts of coordinators, users and the administrators of the facilities that house teleconference sites, and the support of the user consortium by way of user fees. The day-to-day operating expenses of telemedicine are entirely recovered from user fees.

As a provincial communications resource, the teleconference network is a model in Canada as a result of the degree of cooperation exemplified by the many institutions and agencies that make it a reality. The network is divided into 11 separate teleconferencing circuits with over 200 sites in approximately 150 communities throughout the province. In addition to the audioconference capabilities there are also telewriter workstations in over 140 of the communities providing a remote blackboarding function to the user. There are eight video conferencing sites. Outreach beyond the island into Labrador is achieved with an e-mail link to a remote nursing station in Black Tickle and by a video conferencing connection to the Hibernia off-shore oil drilling platform.

The teleconference network also has the capability through a computerized two-wire (dial-access) teleconferencing bridge to provide the user with a) accessibility to teleconferences from a regular telephone anywhere in the world and b) the ability to hold confidential meetings. The bridge also provides individuals who do not have access to a teleconference site with the opportunity to participate in teleconferences via their home or office telephone. The bridge lines can be blended with programs on the dedicated four-wire circuits and with the audio and audiographic functionality.

In addition to providing a technical network service, telemedicine also provides distance education services in the health field, medical data transmission and consultation, and research in health and telecommunications. Reference - http://www.med.mun.ca/telemed/telehist/telemulti.htm

Prince Edward Island

Health care in PEI is delivered via 5 regional health authorities. A very comprehensive health information network (the Health Information Resource Centre) has been deployed in the province and the province is very advanced in this area. A number of telehealth projects were cited at a recent ACHS/ACHI meeting. These include telehomecare and telehospice applications. Teleradiology was also mentioned and a projection was made that telemental health would expand to include some

activity in the area of addictions. The only reference that can be found to this telehealth activity in PEI is on the Industry Canada web site and there is only a reference to the fact that movement of the telehealth network onto the province's broadband information network was being contemplated. No statistics appear to be otherwise available. A proposed telehospice project was discussed at a Smart Communities conference held in PEI in the fall of 1999. Planning for this project is, presumably, going on.

Nova Scotia -

Perhaps one of the most comprehensive and active telehealth networks in Canada is that installed in Nova Scotia. It reaches into 42 healthcare facilities throughout the province. Fifty-three video conferencing systems provide for educational and medical consultations. There are 36 teleradiology sending stations and 11 reading stations. In addition the network provides for delivery of laboratory test results.

Relating the activity level for the year 1998 best portrays activity on this network. In these twelve months there were 444 clinical consultations, 20741 teleradiology cases, 266 educational sessions and 70 administrative meetings. Similar figures for the early part of 1999 are not available, but in the last 3 quarters of 1999 (May thru' December) there were 221 clinical consultations, 12125 teleradiology cases, 155 educational sessions and 53 administrative meetings. By extrapolation, this would suggest that the activity level on the network has stabilized at around the level seen in 1998. However, it is evident that there is interest in developing other clinical applications and this may place a heavier load upon the network in the future. The program is provided and operated by TecKnowledge Healthcare Systems under contract to the government of Nova Scotia. See - http://www.tecknowledge.com/projects/portfolio.asp#NSTN

- This network is a single provider network. Approximate estimates of budget figures are as follows: Fiscal 1998-1999 - $6M total of which $3.5M was for capital equipment.

- Fiscal 1999-2000 - $2.5M, none was invested in equipment

- Fiscal 2000-2001 projected - $3M with approximately $0.5M assigned for equipment purchase. Program management has been placed out to tender which could result in other vendors having an opportunity to operate in Nova Scotia.

In addition there is a Children's Hospital network operating in the Atlantic provinces. This network links seven sites in NS, PEI and NB. The applications are pediatric oncology, pediatric cardiology and pediatric radiology. The Children's Telehealth Network is also operated by TecKnowledge Healthcare Systems. See - http://www.tecknowledge.com/projects/portfolio.asp#CTN

Planning for a provincial "Ask the Nurse" health information and help line is in the early stage of development.

New Brunswick -

The source of the information provided here is a handout to supplement a presentation provided to a workshop conducted by ACHS/ACHI. In 1995 the government of New Brunswick announced that it would maximize telemedicine and telehealth opportunities in New Brunswick. A provincial committee was formed in 1996 to guide the implementation of telehealth. As a consequence a number of projects are on going. They appear to be largely application focused and have been funded from a variety of sources, both federal and provincial. Because of the method of delivery of health care through regional hospital corporations there tends to be some projects that are corporation initiatives, some that are province-wide and others that bear upon the resources of centers of excellence. Two programs can be identified as provincial in nature. They are the cardiology and emergency care programs listed below.

From the information available the following projects can be cited:

- Cardiology - the VITAL project to provide interactive telehealth linkages for early discharge cardiac patients. This project includes some telehomecare activity. Budget - $3M from CANARIE, ACOA and in-kind from partners

- Nephrology - part of the National Nephrology Community Care Telehealth Project. Budget $3M from Health Transitions Fund Award. The network involves three remote dialysis facilities and includes five patients at home. It relies upon a variety of technologies including video conferencing, teleradiology and clinical data transmission.

- Emergency Care - a telecare project providing 24/7 telephone triage and health information. No budget figures available, funded by the Department of Health and Community Services.

- Rehabilitation - two projects, one in neurosciences telehealth, the other in the assistive devices program. No budget figures available, funded in part by CANARIE ($400k).

- Pediatrics - see Children's Telehealth Network listed above under Nova Scotia. Five sites in New Brunswick are part of this inter-provincial network.

- Mental Health - two regional mental health clinics are reported to be in the pilot stage of new projects. No budget figures are available.

- Radiology - listed under this heading is the fact that radiologists in several locations are able to review cases from their homes. Most region hospital corporations have implemented components of a picture archiving and communications system and/or teleradiology systems. New Brunswick, in partnership with the other Atlantic provinces, is currently in the planning stages for a region wide deployment of a PACS/teleradiology infrastructure. PACS is classified as a telehealth project and, by definition, includes the transmission of diagnostic images as well as the appropriate supporting information.

Reference - http://www.gov.nb.ca/hcs-ssc/english/research/telemedicine/appendg.htm

Quebec -

A major commitment to telehealth has been made by the provincial government in Quebec, through the implementation of a province wide health network, the RTSS network, which now joins 600 facilities in a closed ATM network. The initial project that stimulated the telehealth activity was a teleultrasound link between Quebec City and Rimouski for purposes of monitoring newborn babies that were at risk. The technology for this project was supplied by Cifra and, based on the success of this pilot; the project was expanded to 36 sites of which 27 are operational presently. Several other networks have been deployed with some 42 sites in total involved across the province.
Three noteworthy networks are:

- Quebec Paediatric Cardiology Network
- Quebec Côte Nord (North Shore) and Lower North Shore Telepresence Network
- Ste. Justine Pediatric Network Hospital: network for speech therapy linking St Justine and Rimouski, and pediatric psychiatry, linking to hospitals in Baie Comeau, and Sept-Iles.

The RTSS (*Réseau de télécommunications socio-sanitaire*) network provides the infrastructure for telemedicine and many other health informatics applications in Quebec. The primary problem is that it is a closed network and so far, it is under utilized for telemedicine. The network was industry and government sponsored, but little heed was given to the resources necessary to make the network successful and to equip the health care organisations with the necessary human and hardware resources needed to facilitate implementation. The communications infrastructure has been paid for by the Quebec government but in April 2000 these costs are due to transfer to the hospitals. To stimulate continuing use of the network, a committee has been established with the mandate of addressing interoperability, standards and medico-legal issues and with the specific objectives of improving access and reducing waiting lists.

So far, investment in telemedicine equipment has been $4.7M for 36 sites. The RTSS network has been implemented for a total cost so far of about $14M. This is a single vendor network implemented by a telecommunications consortium led by Bell Canada and including Telebec and Quebectel. To date, Cifra has provided the telemedicine equipment, but this exclusivity arrangement ends on March 31st 2000, at which time other vendors will be able to bid on telemedicine and telehealth projects.

Growing out of a regional network pilot project which is now terminated, the RITQ project, the Hotel-Dieu in Montreal, part of the Centre Hospitalier de l'Université de Montréal (CHUM), has been active in conducting complex case conferences internationally with Japan and France for approximately one year. This project, partly funded by the Quebec government, was initiated by Dr André Lacroix to further collaborative efforts with France, and to demonstrate the potential for a G-8 country telemedicine network.

Quebec also operates a 24/7-telephone information, advice and referral service, called Infosanté. The total costs for this service are cited to be $33.3M for 1998/99 when 2.8M calls were answered. This represents 323 calls per 1000 population.

Reference - http://www.ciframedical.com/english/english.htm

Ontario -

The issues facing the province of Ontario are that the telehealth projects are all funded outside of the Ministry of Health and have sunset dates with no policy in place that will provide for sustaining funding. The projects that are presently operating are:

- Hospital for Sick Children
  The Hospital for Sick Children offers telehealth services for the benefit of children located in northern Ontario. In addition the hospital has a number of international connections. By working with both NORTH Net and Women's College Hospital the hospital is able to extend its reach to other communities.
  Reference - http://www.sickkids.on.ca/telehealth/default.asp

- Orillia Soldiers' Memorial Telemedicine Network:
  This site refers paediatric patients to the Telemedicine Centre at the Toronto Hospital for Sick Children. This network began operation in September 1996, and has recently been expanded to incorporate the Women's College Telehealth Network. This system was provided by TecKnowledge.
  Reference - http://www.tecknowledge.com/projects/portfolio.asp#Orillia

- Women's College Hospital Telehealth Network:
  This network supports women's health care in the province of Ontario. The network allows for communication between Women's College Hospital and Orillia Soldiers' Memorial Hospital and enables remote consultations for mental health and diabetic patients in Orillia. This network began operation in May 1997 and has future plans to expand. This system was provided by TecKnowledge.

  Reference - http://www.tecknowledge.com/projects/portfolio.asp#Womens College

- Orillia Alliston Teledialysis Network:
  Orillia Soldier's Memorial Hospital (OSMH) established Canada's first region-wide, teledialysis network. Using computerized systems, the OSMH monitors patients at least 100 kilometres from the regional centre. The network officially opened in October 1997, and the first satellite unit was set up in Alliston, Ontario. Other satellite locations have since been opened at three other hospitals. This system was provided by TecKnowledge.

  Reference - http://www.tecknowledge.com/projects/portfolio.asp#Orillia2

- NORTH Network
  NORTH Network is primarily a teleconsulting and education network sponsored by Sunnybrook Hospital, Toronto. It links two sites in Toronto with four locations in Northern Ontario. This $2.2M project was funded in part by a $1.2M contract with the government's Ministry of Energy, Science and Technology. It is a Cifra based network.
  Reference - http://www.northnetwork.com/ , and http://www.networks-ontario.com/news/e-NR_north.html

- OUTREACH
  Outreach is a telemental health network that was also funded by the Ontario Ministry of Energy, Science and Technology. It operates out of the London Psychiatric Hospital and provides telemental health services into six rural and northern communities - including a First Nations Reserve close to London.
  Reference - http://www.canarie.ca/eng/outreach/health/texpo/Monday/campbellm10.html

- CLOVR
  CLOVR is primarily a teleadministration/telearning network operated out of London Health Sciences Centre and reaching out to the hospitals in South West Ontario. There are presently 14 systems in the network. Of these 9 were purchased in 1999/2000 and 8 more are contemplated in 2000/2001. The applications are reported to be 50% administration, 40% education and 10% clinical.
  Reference - http://www.lhsc.on.ca/isan/tele.html

- HEARTT
  HEARRT is a telehealth project operated by the Ottawa Heart Institute. It has enabled the Institute to provide links to several hospitals surrounding Ottawa as well as into the northern reaches of Canada. The network commenced operation in November 1997 and was funded in part by the Ontario Ministry of Energy, Science and Technology who contributed $2M to the project. It is based on CDC technology.
  Reference - http://www.ottawaheart.ca/researchteleintro.htm
  http://www.rohcg.on.ca/tao/hrt_sum.html
  and
  http://telehealthsolutions.com/media4.htm

- On January 18th, 2000 a consultation process was announced that is to involve the communities of Northwestern Ontario to determine their needs with respect to telehealth. Health Canada announced that $200k had been set aside to assist this process. There is an obvious potential that some telehealth facilities will result from this consultative process but no dates were provided and, at this early stage of the process, it is not possible to determine the level of telehealth investment being contemplated.
  Reference - http://www.hc-sc.gc.ca/english/archives/releases/2000_06e.htm

Ontario is planning a province-wide toll-free telephone information and triage/advisory line and has produced a report on this topic. No budget figures are presented in this report.
Reference - http://www.gov.on.ca:80/MOH/english/pub/ministry/telehealth.html

Manitoba –

There is a pediatric teleradiology project linking Winnipeg Children's Hospital to the Thompson General Hospital in Thompson MB. A total of 888 pediatric X-rays were shipped electronically in the first year. The project began in December of 1998 and is on-going. After a one-year evaluation, the project is now on going with costs being paid by the Burntwood Regional Health Authority and Manitoba Health. MBTelMed provided sponsorship.

An enterprise filmless radiology project research project is in progress.

In its second year, this is a three year, $5 million project linking Winnipeg to Portage La Prairie Manitoba. It links the hospitals and some radiologists' homes within the city. The industry partner is Manitoba Telecom Services. Funding is from Industry Canada.

A telepsychiatry link between the Health Sciences Centre and the The Pas Hospital has been underway since January 1998. A video conferencing link is used for assessment and treatment of patients as well as consulting with mental health staff from that region. After a one-year assessment period the project is on going with all costs absorbed by the Norman Regional Health Authority. MBTelMed provided sponsorship.

A 2-year National Transition Fund project by Health Canada called "A Model for Integrated Health Care Delivery for children With Disabilities is valued at $2 million. It provides a web site, a children's record system and two-way video conferencing to Brandon and Thompson.

A fifteen site network is being proposed to serve the province on a wider basis. This network will be similar in scope to the Nova Scotia network. By extrapolation this suggests a potential expenditure of about $1.25M for equipment and approximately $900k per year for operational expenses.

Saskatchewan -

The major network in Saskatchewan is Northern Telehealth Network. This is operated by Saskatoon District Health and links Saskatoon to seven other sites north of that city. The network is used primarily for teleconsulting and telelearning activities. Equipment for this network was provisioned by CDC and the Saskatchewan government invested $1.5M in its purchase.

Reference - http://telehealthsolutions.com/newsletter_spring1999.htm#2
http://www.sdh.sk.ca/communications/news/press/news150199.htm
http://www.sdh.sk.ca/project/telehealth.htm
and
http://www.gov.sk.ca/newsrel/1999May/462.99051405.html

Alberta -

Perhaps the largest network in Canada in terms of number of sites in the alberta we//net telehealth network. As of January 2000 it had 55 sites and operates in a multi-vendor environment. Half of the installations were provided by Norstan in 1999 and are VTel video conferencing systems. All 19 Health Authorities in Alberta are funded for the purchase of equipment and receive operating grants to assist provision of resources. In addition, the province provides an MCU Bridge service to all sites. Of the 19 health authorities, 12 have installed equipment and, because the Alberta Mental Health Board operates a province-wide program there are facilities in 14 regional health authorities. The majority of the installations took place late in 1999 so that no data are yet available concerning utilization. Twenty teleultrasound sites with live video are projected to be implemented in 2000, in addition to about 20 video conferencing systems. It is expected that, by the end of 2002, the

combined total of video conferencing and teleradiology sites will number 130 to 140. A move is underway to move the telehealth network into an IP environment using the government network, AGNPac.

The funding is almost $25M over four years. Of that, approximately $16M is for equipment and the remainder is available for operational expenses - $2.9M/year.

In 1999 approximately $4.5M was expended on equipment and in 2000 a further $8M is projected to be spent. This budget accounts only for the alberta we//net funds and does not include the expenditures incurred by the individual Regional Health Authorities.

Reference - http://www.albertawellnet.org/telehealth.html

http://www.keston.com/GHAtelnet

Alberta also operates a 24/7 telephone call centre for provision of health information. Another call centre is provided for STD information. Neither of these call centres engages in teletriage activity. The 1997 activity for the health information site was 8483 calls per month and for the STD information line was over 30,000. The cost of the STD information line is estimated at $100k per year. A telephone triage service is in the early planning phase.

British Columbia -

The situation in British Columbia resembles that in Ontario. There have been a number of individual projects and these are well documented on their web site. However, most of these projects appear to be limited to single point-to-point connections that are research in nature using very high bandwidth facilities in urban settings. Some are proposed projects that do not appear to have been initiated.

In 1996 a teleradiology pilot was conducted that linked a hospital in Vancouver to 11 sites in NW BC. This was funded in part with $1M from the Ministry of Health. In 1999 the pilot study had been completed and evaluation was underway.

The Children's Hospital in Vancouver has established some teleconsulting activities and links are reported to have been made with 10 communities in the interior and northern BC. It is not evident from the material presented if this constitutes a telehealth network or if external service providers have been used to supply video conferencing facilities.

An interesting distance education application is included on the BC web pages as a telehealth application. It involves distance education of paramedics but seems to be more directed to the use of the Internet for communications with a CD-ROM to supplement the learning experience.

A two-year pilot project self-care program was initiated in 1997 to a selected number of residences in Victoria. Those persons included in the project could call a telephone help desk staffed by trained nurses and would also receive a periodic newsletter. The estimated cost of this pilot was $600k. The project has been completed, but no results are available at this point. However, a province-wide project is planned. The second demonstration project would encompass the whole province for 3 years. Like the Victoria pilot study, this project would provide health information and toll-free access

to triage by a call centre staffed by nurses. The approximate budget for this project is $18M over three years.

A number of other projects are cited on the BC web site under the heading of telehealth but they fall outside of the definition used for this present survey.

In 1999 the BC government published a report on telehealth in the province (see reference below). This report did not indicate the avenue for implementation of telehealth in the province so that the future is difficult to predict. As is the case with Ontario, there is considerable potential for growth but, until a policy for further deployment is adopted by the government, it is likely that pilot studies and projects of limited scope will remain the principal means by which telehealth will grow in the province.

Reference - http://www.hinetbc.org/telehealth/telehealth.html
and
http://www.hlth.gov.bc.ca/him/moh/img/paper.html

Nunavut -

The IIU network presently connects three sites in the territory – Baffin, Pond Inlet and Cape Dorset. The network is used to provide medical consultations and support the personnel manning the remote nursing stations. The system uses CDC equipment and is satellite based. The estimated cost is of the order of $500k with an operational budget of similar magnitude. The vision is to expand this network to link to all 26 communities in the territory so that there is considerable potential for growth in this region. However, that growth is expected to be implemented in phases over a number of years.

North West Territories -

Westnet provides links between Yellowknife and three other locations in the North West Territories. The major function is the provision of teleconsulting services and the enabling of triage in emergency care situations that might require evacuation by air ambulance. The system was provided by CDC. No evidence of potential expansion is available.

Reference - http://strategis.ic.gc.ca/SSG/in03349e.html
and
http://www.nnsl.com/frames/newspapers/archive98-1/oct98/oct12_98health.html

Yukon –

The Yukon government is undertaking a pilot telemedicine project. This project will first develop a narrowband infrastructure in order to accommodate clinical applications to the communities. It will make use of multimedia store and forward telemedicine technologies to deliver specialist services. The number of sites contemplated is not available.

Reference - http://strategis.ic.gc.ca/SSG/it04764e.html#5

Federal Government, Health Canada, First Nations Program -

The Federal Government, through Health Canada, has an initiative in place to provide telehealth services into five First Nations communities. These are located in Anahim Lake, BC; Fort Chipewyan, AB; Southend, SK; Berens River, MB and La Romaine, PQ. The links that are contemplated are primarily within the provinces in which the communities are located. This is a pilot project which is intended to demonstrate the value of telehealth for First Nations communities with the expectation that the technology will be made available to more communities in future years. The budget for the pilot study is $2M, of which $750k is allocated to equipment costs. As of the date of writing purchasing decisions have been made in four of the five communities. TecKnowledge will supply two systems; CDC and Cifra will provide one each. On the assumption that the evaluation of this pilot study will be positive there is considerable potential for future growth as telehealth is implemented throughout the Canadian aboriginal communities.

Reference - http://www.hc-sc.gc.ca/msb/fnihp/thealth_e.htm

Region or Jurisdiction	Actual Equipment Expenditure 1999-2000 ($M)	Planned Equipment Expenditure 2000-2001 ($M)	Operational Expenditures (estimated - $M)
Newfoundland	NA	NA	NA
Prince Edward Island	NA	NA	NA
Nova Scotia	0	0.5	2.5
New Brunswick	3.4	3	NA
Quebec	7	NA	33.3 (telephone triage) 5 (video conf)
Ontario	5.2	3	NA
Manitoba	7	1.25	0.9
Saskatchewan	1.5	NA	0.8
Alberta	4.5	8.0	2.9
British Columbia	2.6	NA	6.0 (telephone triage)
Nunavut	0.5	NA	0.5
North West Territories	0	NA	0.5
Yukon	NA	NA	NA
Health Canada	NA	0.95	1.25

Table A – Estimated actual and planned telehealth equipment expenditures ($M) by region. Note – Many of these figures are estimates based on the known number of systems installed or planned. Due to the diversity of programs in some jurisdictions these figures are either not available (NA) or cannot be confirmed.

IN THE WORLD

There are many reports, surveys and publications, both online and on paper, which attest to the extent of telehealth activity in the world. The following paragraphs present a brief overview of representative examples.

In 1998 the *Journal of Telemedicine and Telecare* [1] published a survey of Telemedicine and **Developing Countrie**s which had been undertaken by the International Telecommunications Union (ITU) Development Sector. Responses to this survey came from 59 countries, and half of the respondents indicated they already had telemedicine installations or were planning to implement projects or sites within their own countries.

The Association for Telemedicine Providers (ATSP) together with *Telemedicine Today* magazine has now published 3 surveys on **US Telemedicine Activity**. In 1998, they identified 157 programs actively operating in 46 states offering health care and information services to 1,345 sites in a variety of medical specialties. The applications cover over 45 clinical specialties ranging from mental health (43 programs), cardiology (45 programs), dermatology (40 programs), orthopedics (30 programs), ophthalmology (8 programs), and internal medicine (10 programs).[2] The 1999 survey was not yet available at the time of writing this report.

A document entitled *European Telemedicine 1998/9* published in conjunction with the European Health Telematics Observatory and the Royal Society of Medicine provides an overview of telemedicine experience in **Europe** and a small number of other countries. This report attests to the wide range of activity in practice and research in 15 areas of telemedicine and home care, as well as in tele-education.

In 1998 John Mitchell and Associates prepared a report of the telemedecine industry in **Australia** for the Australian Department of Industry. [3] According to this report, as of early 1998, there were around 250 functioning videoconferencing-based telemedicine sites in Australia, up from approximately 30 sites in 1994. At that time, two applications dominated the Australian telehealth scene – telepsychiatry and teleradiology. This report has since been superceded by a more current one, which is reviewed below, in the E-Health section of this report.

As of 1998, there were 133 telehealth projects underway in **Japan**, (65 of which are in the area of teleradiology). According to this report, there are a number of key factors shaping telehealth demand in Japan, including the ageing population. Currently 16.6% of Japanese inhabitants are over the age of 65, a figure roughly on par with other industrialized nations. By 2010, however, it is projected that Japan will have the world's highest proportion of elderly residents; by 2030, it is estimated that nearly one-third of all inhabitants in Japan will be senior citizens.

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[1] Wright, David, Telemedicine and Developing Countries, A Report of Study Group 2 of the ITU Development Sector, Journal of Telemedicine and Telecare, vol 4, suppl 2, 1998.

[2] Association of Telemedicine Service Providers (ATSP) 1998 Report on US Telemedicine Activity.

[3] Fragmentation to Integration: National Scoping Study of the Telemedicine Industry in Australia, John Mitchell for the Department of Industry, Science and Tourism, Australia.

Major changes in the telehealth industry in Canada and elsewhere are affecting the technologies and applications previously considered under the umbrella of telehealth. The new "buzz-word" is no longer videoconferencing, or even telehealth or telemedicine, but rather **e-health**. This term is being used to describe two different sets of activities: one which relates to e-business generally, and the other which relates to a collection of electronic healthcare activities, previously described in categories two and three of the SCF telehealth report. The advent of e-health and all that it brings is affecting very seriously the telehealth industry world-wide and Canada is no exception. In a further section, two recent reports on the subject of e-health will be reviewed.

The major market drivers for telehealth, however, remain the same, for example, the shortage of specialists in remote regions, the sense of professional isolation and the growing demand for equitable and accessible health care services. These factors, coupled with the downward trend in equipment and telecommunication costs, the aging population, and the rise of ambulatory care in favour of long-term hospitalisations, are making home monitoring and telecare attractive options for patients and providers alike.

A literature review on the subject of telehealth and telemedicine focussing on factors influencing the industry was conducted for this study. The report of this review is summarized in *Appendix Two.*

TELEHEALTH MARKET OVERVIEW

GLOBAL

There is considerable variation in numbers used to estimate the size of telehealth markets. Looking at the **telemedicine segment alone**, the American Telemedicine Association provided the following examples of these variations: [4]

- The **Business Communications Company** (BCC) in a 1998 report estimated the current U.S. market for telemedicine at $65 million, to reach $3 billion by the year 2002 based on the high growth rates of leading market segments and an assumption that full reimbursement for telemedicine services will continue to become more common. The report cites provider plans for predicting a 280 percent growth in prison telemedicine sites over five years and a doubling of military investment over seven years.
- **Feedback Research Services** (FRS), a marketing firm producing a number of reports on the subject states that the current annual U.S. market for telepathology, teleradiology, and videoconferencing telemedicine systems is under $100 million. They estimate that worldwide sales of products and services during the 1990s reached an estimated $520 million, cumulative, through the year-end of 1996.
- **Frost and Sullivan** (F&S), an international marketing, consulting and training firm covering many different markets, in the April 1998 issue of ADVANCE for Administrators in Radiology & Radiation Oncology estimated PACS and teleradiology systems market revenue for the U.S. and Europe for 1998 at $368.8 million with the United States generating 81 percent of this

[4] Jonathan Linkous, Predicting the Market for Telemedicine, ATA article published on the web: http://www.atmeda.org

market. They project a growth rate of about 28 percent over the next six years yielding a total annual market of $1.6 billion by 2004.

John Mitchell, in his 1998 report cited earlier, estimated that the telemedicine industry in Australia alone would grow from $24 M in 1997 to $ 54 M in 1999, but one of his respondents actually predicted that telemedicine would become a $4 billion industry (that is, 10% of the $ 40 billion medical industry in Australia).

In March 1998, a report prepared for Industry Canada by **Service Growth Consultants Inc** [5] estimated the global demand for telehealth services by the year 2000 to be US$1.125 trillion based on the following market segments: direct clinical services (US $804.2 billion); peacekeeping and battlefield support (US$37.0 billion); professional back-up (US$22.5 billion); consumer health information (US$21.6 billion); continuing professional education (US$3.9 billion); and management of health care delivery (US$235.5 billion).

These large variations in market predictions and estimates are not surprising, given the variety of components and market segments which may or may not be included in the estimates – and these in turn, depend on the definition of telemedicine and/or telehealth. Jonathan Linkous, Executive director of the ATA, claims the question regarding market size is asked of the ATA about three to four times a week. Unfortunately, there is no simple answer:

> Measuring the market for telemedicine is difficult for several reasons. First, telemedicine products and services are often part of a larger investment by health care institutions in communications technology and the delivery of medical care. Telemedicine is not a separate specialty and is often integrated with the overall delivery of health. Second, telemedicine is a very new investment for many institutions and there is little history from which to draw projections. Finally, there is no commonly recognized definition or set of services and devices that constitute telemedicine. Different health care institutions and consulting firms define telemedicine in quite different ways. [6]

CANADA

In 1997, the Industry Canada SCF report predicted that Canadian provincial, territorial and federal governments would spend $500 to 750 M over the next five years in total in the five categories of applications of telehealth, including new and on-going projects and their associated infrastructures. This figure was arrived at by adding what each of the 14 provincial, territorial, and federal governments is spending and plans to spend over the next 3 to 5 years, in the 5 segments of the telehealth industry, one of which is telemedicine. In light of federal budget announcements relative to potential health information highway and network infrastructure expenditures, telehealth installations and applications expected to be needed by remote and First Nation communities, more requirements for home telecare and selfcare services and devices [7] by an increasingly ageing population, the

[5] Industry Canada. Canada- Healthkeeper to the World: Canadian Opportunities in Global Telehealth Markets. Report prepared by Service Growth Consultants Inc. March 1998.

[6] Jonathan Linkous, Op cit. http://www.atmeda.org.

[7] Note *Appendix Six* contains a list of some of the Telecare and Selfcare initiatives currently active in Canada.

continued shortage of physicians in rural areas, the closures of many hospital beds, the large number of institutions and organizations involved in telehealth in Canada [8] the figure of $500 M appears as fairly conservative. However, it does need to be broken down by market segments, by application, and by type of expenditure. For this report, our interviews of Canadian companies reflect mostly companies selling equipment, and do not include, for example, infrastructure or telecommunications costs, or costs related to institutional resources. **Table A** (page 16) provides some of the telehealth expenditures for equipment and operational costs, in different Canadian provinces, based on our survey of projects and sites across the country.

CANADIAN CAPACITY TO RESPOND TO TRADITIONAL TELEHEALTH MARKETS

In 1997-8, all Canadian companies involved in telehealth, in any of the 5 telehealth categories, whether dedicated or partly engaged in the field, were encouraged to register in Industry Canada's CCC database. These companies, their profiles, products and services, served as the basis for developing the telehealth SCF. Over 120 companies involved in telehealth with products in the following categories registered themselves as telehealth companies in the CCC database: diagnostic software, encryption, medical imaging software and hardware including PACS systems, tele-radiology, nuclear medicine, ultrasound, CT and MRI imaging; management and scheduling software; telecare monitors, health information, peripherals or tools used with telemedicine equipment; mobile workstations, videoconferencing, products associated with medical and health networks, and telecommunications firms; emergency response systems and services; home telecare, and consulting firms specializing in health and medical information, business and management. The present study has focused on only those companies which are solely dedicated to telehealth business, in 3 of the 5 telehealth categories, along with a few key companies for which telehealth is not their main business. By narrowing the field to these dedicated companies, it is expected that this report can reflect more accurately the Canadian capacity to respond to the demand for telehealth products and services.

RESULTS OF THE INTERVIEWS

In order to locate the Canadian companies dedicated to telehealth business in the 3 categories selected, that is, (1) telemedicine, (2) distance CME and CHE, and (3) patient telecare and call center companies, the following sources were consulted: the Canadian Company Capability (CCC) list on Strategis; selected publications including a background paper on Tele-homecare, the Western Canadian Health Informatics website at http://www.wchi.org/wchidb/search.asp, a list of companies referenced for the SCF study on the Telehealth industry in 1997, Health Canada's website, and the Telehealth Association of Ontario, the Electric Library (subject telehealth & telemedicine), a market study conducted by the Quebec government (unpublished) and the Telemedicine Information Exchange (TIE). Where available, profiles of the companies were obtained and studied.

Using the search engines Yahoo, Metacrawler, Lycos, Infoseek, MSN Search and selected other sources, a further 85 were identified and their web sites were visited. Information was reviewed and,

[8] Appendix Seven provides a list of institutions and organizations in Canada which are presently involved in telehealth activities.

in appropriate cases, downloaded to be further analyzed. By contacting the companies on the telephone, we found that 3 were no longer in business and 2 more could not be reached because there was no service at the telephone number listed. Several attempts were made to contact these and other companies who had changed names, been bought out, or relocated. A total of 4 were eliminated during the first round of telephone interviews because they were not totally dedicated to telehealth and/or they were public sector organizations.

Of a total number of 19 organizations which fell into our definition of a "dedicated telehealth company", 5 are in telemedicine, 6 are in distance Continuing Medical Education (CME) or Continuing Health Education (CHE), and 8 are in home telecare, call centers or other services to consumers. Each one of these companies was contacted - and a representative interviewed either in person or on the telephone, using the interview guide found in *Appendix Three*. The results of these interviews are tabulated and presented in *Appendix Four*, **Tables One, Two and Three**. All other organizations have been tabulated in *Appendix Five* as organizations that are involved in telehealth but whose main business is not telehealth. In addition, several companies were interviewed but not considered in the total of interviewees because they were reluctant to reveal any information about their activities or the extent of their earnings. Still others did not fit the "solely dedicated to telehealth" attribute.

Of these 19 companies dedicated to telehealth, 4 would not provide sales figures and 2 declared that they had O sales in 1999 as they were new "startups". The remaining 13 companies dedicated to telehealth activity accounted for $40.5 million of sales in 1999.

One new company, EquiDistant, though dedicated to telehealth, was not included in our summary tables because it is a new company with a suite of products and services that seem to fit in a number of the categories. Following is a brief description:

> EquiDistant is a Newfoundland-based Alliance comprised of FUTUREWORKS Inc., Collaboratives Technology Inc. and TETRA of Memorial University of Newfoundland. The objective of EquiDistant is to provide networked-based services to rural and remote locations, aimed at telehealth, tele-education, government information services, economic development and business development. EquiDistant will initiate the commercialization of the Remote Community Services Telecenter (RCST) concept in Canada and export markets.[9]

Telemedicine Companies

Telemedicine is defined simply as medicine practiced at a distance using communications and information technologies. Many categories of companies have been listed as "telemedicine" companies in the CCC data base, but very few are suppliers of systems for remote telemedicine. The field of telemedicine seems to be dominated in Canada, by a very small number of private companies, namely **TecKnowledge Healthcare Systems Inc**, **Computing Devices Canada (CDC)**, companies belonging to the **Digital Group**, and **Cifra Medical Inc**. **Smarthealth** and **Millennium** Technology are possible candidates but at this time there is little or no information available on these companies. Smarthealth was the original vendor for a province-wide telehealth initiative in Manitoba but has since reduced its operations in that province, and Millennium has not

[9] CST Newsletter, http://www.ucalgary.ca/md/cst.

reported any sales yet because it has devoted most of its energies to r&d. All of these companies claim they are exporting, with markets principally in the USA, in Great Britain, Europe, South America, Africa, the Middle East and the Pacific Rim. The companies are all involved in r&d and invest at least 10% of their sales figure in r&d. The number of employees ranges from 8 to 45 for a total of 130 employees. With the exception of one company, they all expect to increase their revenues in the next fiscal year by at least 30%. These companies are integrators, combining off-the-shelf technologies and marketing products such as workstations equipped for videoconferencing, tele-ultrasound and tele-radiology, with extra peripherals for assorted telemedicine examinations.

Only two of these companies provided sales figures for the previous year, and of these, one wishes that the figure remain undisclosed. The companies identify as their export markets, the USA, the Caribbean, China and Iceland.

While the number of telemedicine companies is very small – the situation has not changed much since research was undertaken for the Telehealth SCF, in 1997-8. In addition to the companies named above the other dedicated telemedicine companies were: **Canvas Healthcare Systems**, which has now been purchased by **Tandberg**, a videoconference vendor active in a number of markets, including tele-education and telemedicine; Theratechnologies, now called **Andromed**, a company which markets an electronic stethoscope, but has since branched out to provide online survey questionnaires for patient satisfaction, and **Telus** Corporation, the Alberta telecommunications company which, since merging with BCTel, has reduced its involvement with telehealth. Telus and CDC were interviewed as part of our list of companies not dedicated to telehealth.

Tele-education companies involved in CME and CHE

It is surprising to note that there are few Canadian companies dedicated to distance CME and CHE. Only six companies were interviewed, though several other private companies, and many public sector organizations are engaged in this field.

Two of the companies which are very active – namely **Conceptis** Technologies Inc and **I.C. Axon** Inc - are highly successful medium sized private companies with over 100 employees and revenues between $5 and 10 million.

It is possible that the low numbers of private companies in this field are the result of institutions in the public sector having cornered that market. For a list of some of these, see Table Nine in *Appendix Five*. There are 16 faculties of medicine in Canada, all of which are active in CME, and several are involved in delivery of distance CME. The rise in the number of courses available on the Internet is remarkable. Some community colleges are offering health-related courses exclusively on the Internet (for example, New Brunswick Community College in Saint John, N.B.) and there is at least one university-based nursing program available by distance education (at St Francis Xavier University). The Office of Learning Technologies (OLT) has provided funding assistance to a number of public sector organizations undertaking projects in this area. The Canadian Association of Distance Education (CADE), the Réseau d'enseignement francophone à distance (RÉFAD) and the Canadian Association of University Continuing Education (CAUCE) have all provided listings of health and medical programs and courses available by distance education.

The six companies in the field of tele-learning reported sales totaling at least $13 million, and all of them expect to significantly increase their sales figures next year. With the exception of one company, all companies interviewed are exporting, to Singapore, USA, Malaysia, Australia, New Zealand, Europe, Asia, Mexico, the US, and the Caribbean.

There are several private Canadian companies offering courses on the subject of telehealth and telemedicine. None responded to our request for interviews, and, ironically, none of these courses are available online or by distance education yet.

Telecare and telemonitoring companies

A number of companies in this field have come and gone – including an innovative company, Telemedisys, which was purchased by Bell Canada, became Medinovum for a brief period, and then closed. We were unable to reach some other companies in this field which were originally considered for the SCF: Althin Biopharm, which has abandoned its tele-dialysis software project; Bioma Recherche a company specializing in telemonitoring and telemetry; Every Minute Counts, a cardiac monitoring company; and Doctor by Phone, a telephone consulting company. However, other companies in this field have remained active and are experiencing growth including Globalmedic, Clinidata, Baylis Medical, and Lifeline Systems Canada Inc.

These companies offer a range of services and products from triage, telemonitoring, patient education, telemetry and emergency response, online health information services and call centers. Eight companies were interviewed for this profile. Their sales totalled over $19 M in 1999 and they employ over 230 people.

The field of home care is growing in Canada, and there are a number of emerging self-care and home care projects (as shown in *Appendix Six*). Though home care services could probably use home telecare devices to augment their face-to-face encounters, or, on occasion, to partly replace them, the challenge facing telecare and telemonitoring companies is that some of these services are not prescribed by physicians and therefore patients cannot bill their provincial health insurance plans for devices such as home monitors. Certain inexpensive but well known systems, such as Lifeline, however, are paid by private citizens. Triage and call centers seem to be growing in popularity and are being funded by provincial government health care budgets. Clinidata has established call centers in Northern Ontario and in New Brunswick. It is the most successful company on the list of telecare and tele-monitoring companies.

OTHER TELEHEALTH COMPANIES

As stated earlier, a wide variety of companies are involved in telehealth and telemedicine, including many companies not exclusively dedicated to telehealth business. A short list of such videoconferencing, computer, tele-imaging, and consulting companies can be found in *Appendix Five*. (see Tables Eight, Ten, Eleven and Twelve). The following companies, selected from these lists, were interviewed for this study: Telus Advance Communications, Tandberg, Computing Devices Canada, Starvision, and Elscint-GE Medical Systems. Unlike the dedicated companies, it was most difficult to obtain information from some of these companies. Plus, several other companies were contacted but did not return calls, or were uninterested in participating in an inteview, even a short

one, about telehealth. The sample being so small and the information so scant, it hardly seems possible to draw a generalized picture from these companies. Three of them (Telus, CDC and Starvision) have scaled down their telemedicine operations for a variety of reasons. It might be useful to interview more of these companies to find out why their telehealth business has not grown. Added to this list could be the large multi-media, telecommunications and computer companies.

OPPORTUNITIES AND CHANGES IN THE TELEHEALTH MARKET

The principal changes in the Canadian telehealth industry are driven by the need to integrate new products and services into the rest of the health care system endeavor. This need for integration is the basis for the growth of e-health in other countries, and the establishment of the priority of infrastructure development in Canada. Thus suppliers can no longer afford to indulge in short-term pilots, experiments or pet projects but must conceive their business model so as to become an integral part of the total health care enterprise.

IN TELEMEDICINE

Principally because of the need to supply remote communities with the necessary linkages needed to resource, staff and manage their own health care matters in a cost-effective way, remote telemedicine is reliving a resurgence in Canada. In spite of this resurgence, there are no new Canadian companies to fill this need, which cannot be bridged by videoconferencing equipment and telecommunications companies alone. One of the principal problems involved in implementing remote telemedicine relates to the lack of consistency in telecommunications infrastructure across the North, and indeed, across Canada – this is without a doubt the greatest challenge facing remote and isolated communities who wish to be connected in a telemedicine network today in Canada.

IN TELE-CME AND CHE

Isolation of providers in remote centers is but one motivator for the use of tele-CME and tele-CHE. Clinical Practice guidelines now increasingly urge multidisciplinary approaches to patient care and the importance of keeping abreast of change in management of disease. Thus tele-CME has become a necessity and most busy practitioners cannot afford the time to rush off to sit-down seminars in far off places. Web-based cybersessions and on-demand on-line courses are rapidly filling the needs expressed by professionals in both remote and urban centers. While traditionally, universities have filled this gap, new cyber-based companies have recently emerged which are taking the distance education tele-CME and CHE market by storm.

IN TELEMONITORING AND TELECARE

The rise of ambulatory care and the need for consumers to become more informed in order to manage their own health matters and avoid hospitalization are only some of the factors motivating the use of call centers, of telecare and telemonitoring devices from the home.

A new type of tele-care service has sprung up recently, the so-called self-care services using telematics technologies. An informal survey undertaken by Health Canada reveals sixteen active or planned projects in this area, involving three private companies, only one of which has been interviewed for our profile (Clinidata). These self-care projects are reported in *Appendix Six*.

RISE OF E-HEALTH

E-HEALTH IN THE WORLD TODAY

The convergence of telecommunications and the Internet is setting a path whereby telehealth is moving closer to the e-commerce environment which has been dubbed as **e-health**. Increasingly health information is being disseminated via the web and this leads to a more informed consumer who is better able to make his or her own health decisions. This increased knowledge implies that the consumer is better placed to challenge the decisions rendered by health care providers. The Internet has afforded health care providers with a convenient and friendly means by which to communicate within the system and it is notable that there has been a burgeoning of computer based health care systems that utilize browser interfaces.

E Health seems to be a catchall word designed to cover everything from use of the web for teaching, for web cast programs and meetings, the spread of videoconferencing using Internet protocols (IP), the use of the Internet by consumers and patients to obtain information and connect with their physicians, the growing use of networks for exchange of electronic medical records and medical images and the increasing penetration of e-commerce and EDI for cost-effectiveness, data warehousing, and managing health care institutions. The following list covers only a sample of the entire spectrum of the internet-based activity called e-health.

Videoconferencing and the Internet

As our review of two reports suggest (page 28), there are many aspects to e-health. Of crucial and immediate application for the rapid and inexpensive deployment of telehealth in Canada is the merging use of the IP protocol and standards for videoconferencing. While trials and experiments conducted recently have not convinced users to abandon classic videoconferencing for IP-based video, there is an increasing demand for videoconferencing over IP for multiple reasons.

- **Cost**: classic videoconferencing typically uses 6 telephone lines for point to point communications. Add other users in a multipoint meeting and the costs escalate. While telcos have often defended the high cost by comparing one hour of videoconferencing to travel costs, this is no longer a sound argument since videoconferencing is seen as a necessity even between not so distant locations, or between multidisciplinary groups too busy to travel even a short distance to attend a meeting.

- **Interoperability**: A recent article in MD Computing states that "Healthcare information technology is in dire need of a new level of interoperability".[10] With the advent of closed and proprietary health networks (for a Canadian example, consider the RTSS in Quebec), there is a need to find ways to bridge the gaps between WANS and health networks, PACS and tele-video (etc), and video over IP can bridge this gap.

- **Convenience:** Videoconferencing over IP permits cybersession to be delivered to the desktop, downloaded and saved for future reference.

- **Digitization:** by far the most important attribute to video over IP is the possibility of easy exchange of digital information, such as medical records, CT scans, Powerpoint presentations, ultrasound images, etc.

These advantages are well summarized in a recent editorial by Ace Allen in the magazine Telemedicine Today. It is noteworthy that Ace makes reference to a Canadian telehealth company, TecKnowledge Healthcare Systems.

> "Videoconferencing right now is like a car cautiously approaching a busy intersection, waiting to accelerate when the coast is clear. As we show in this issue, the industry has grown steadily but has yet to reach its rosy promise. The informational value that interactive video adds to a phone call has not been enough for most businesses, hospitals, or medical practices to justify its cost.
>
> However, the price of televideo continues to plummet, in terms of both equipment and transmission (bandwidth). Within the next year or two, rapidly developing technologies will allow high quality videoconferencing and data conferencing from point to point throughout much of the U.S., for an aggregate cost of no more than a few standard phone lines. Even today, high bandwidth ADSL and cable modem access is available for under $50/month to several hundred thousand homes and businesses. Sprint has designed its ATM-based ION network so that it gets to the user via DSL for the "last mile." I've seen a demonstration of the ION product, which is to be priced at consumer levels (i.e., not much more than cable access); it features near-broadcast quality audio/video as well as data transfer and Internet access. The flaw so far has been that most telcos have been balking at deploying DSL. This is presumably because it cannibalizes their T1 and ISDN revenues, as a recent lawsuit against SBC in Texas suggested. The other flaw is that ATM deployed over a large WAN can be very difficult to manage, as Sprint is finding out with its ION trial sites.
>
> Meanwhile, the ubiquitous Internet Protocol beckons as a low-cost way to transmit video. It certainly works for data, and has been used increasingly for voice (VoIP). As yet, it hasn't worked well for video. Recently I queried Linda Weaver, Chief Technology Officer at TecKnowledge, about the current state of IP protocols and video. I should mention that TecKnowledge is the largest telemedicine integrator in

[10] Kilbridge, M.D., E-Healthcare: Urging Providers to Embrace the Web. MD Computing,17:1 January/February 2000, pp 36-39.

> Canada—possibly in North America—and that an important part of her job is to scout out the best teleconferencing solutions. Her lab has experimented with IP videoconferencing. It worked only for limited intranet trials where the bandwidth was closely controlled. For the Internet, image quality wasn't good, even with high bandwidth access. This is undoubtedly due to the oddball routing and significant quality-of-service issues associated with the Internet, and to problems with the way the Internet Protocol handles the packets that make up separate audio, video, and data streams and re-aggregates them at the end-user site. These issues will be solved as Internet 2, with its quality of service guarantees, comes on board, and as the superior packet-handling capabilities of ATM are adopted into the Internet Protocol. Indeed, a developing Multiprotocol Label Switching protocol (www.ietf.org/1id-abstracts.html) may be a harbinger of the melding of IP and ATM.
>
> Just as IP revolutionized data traffic by making it platform independent, so it (or a close cousin) will very likely revolutionize video traffic. When that happens, there will be no barriers to cheap, high quality interactive video. [11]

eHealth for teaching

A National workshop on the Use of the Internet for Research on Heart Health Dissemination sponsored by Health Canada was held March 2000 in Montreal. Attendees were representatives from the G-8 countries involved in projects using telematics for disease prevention and health promotion. The Heart Health initiative is one of the G-8 health telematics sub-projects (Sub project 3). [12]

One of the well-known speakers at this meeting was Ronald E. Laporte, PhD, Professor of Epidemiology, University of Pittsburgh, famous for his work in developing the Supercourse on Epidemiology. This course now involves over 1200 faculty members in 101 countries and contains 78 lectures, which are "donated" by medical faculty, some of which are available in 8 languages and most of which are available in English, Spanish and Japanese. The lectures are icon driven and users – faculty and students – can go to the site and download slides and lectures for their own use. Presently this course has been set up on 25 mirrored servers all over the world. 2500 individuals per year are accessing the lectures. LaPorte claims these courses are not distance learning but rather a form of content sharing. The model allows lecturers from around the world to provide content for developing countries that have no access to content – such as journals, multimedia ware etc.

Though this initiative is run on the basis of freeware - it stands as an illustration of the deep penetration of the Internet for purposes of disseminating medical information and teaching. LaPorte claims this type of Internet-based approach could easily be adapted to prevent disease and promote health all over the world. See http://www.pitt.edu/~super1/assist/sum.htm.

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[11] The Force that Through the Green Fuse Drives the Flower. Ace Allen Editorial. Telemedicine Today. October 1999.

[12] Other G-8 telematics sub-projects include one on telemedicine (sub project 4).

The following brief review of two contrasting reports on the subject of e-health should provide additional information regarding this growing phenomenon.

FROM TELEHEALTH TO E-HEALTH IN AUSTRALIA

John Mitchell, author of the 60-page report "From Telehealth to E-Health: the Unstoppable Rise of

> *E-health is the use in the health sector of digital data – transmitted, stored and retrieved electronically – for clinical, educational and administrative purposes, both at the local site and at a distance. E-health is now the term to use when describing the rise of digital technologies, electronic transmission and the convergence of technologies. This term is all-inclusive and captures the use of Internet technologies and the rise of the information economy……..e-health is the overall, umbrella field that encompasses telemedicine. (P 1)*

The idea which drove the e-health theme for Mitchell began with the writing of an earlier report on the subject of telemedicine, entitled *Fragmentation to Integration: The Telemedicine Industry in Australia* [13]. In this report he advocates the need for absorbing telehealth into the mainstream of health.

In his e-health report, Mitchell argues that the effectiveness of telehealth is limited because presently, it is seen as outside the mainstream of healthcare, as a peripheral activity. He indicates that the convergence of technologies make it unwise to emphasize solely the distance factor in telehealth - but rather that there are important clinical benefits to combining information and telecommunication technologies. Consumer and provider interest in health information, evidence-based information and many other applications are also driving the move to e-health. He provides definitions of telemedicine, telehealth, health informatics, the information economy, e-commerce and finally e-health, showing how each of these terms was invented to define new practices and activities made possible by the invention and application of new technologies (p 6).

Through the presentation of many case studies (though some are scenarios rather than case studies), he shows how many telehealth and telemedicine projects and private companies in Australia are examples of e-health in practice: call centers, home monitoring equipment, videoconferencing combining live interaction and digital medical imaging, CME and CHE using CDRoms over the internet in combination with live presentations, digital ECG and EEG analysis, and many other examples including online consultations with physicians via e-mail (www.doctel.com.au). Mitchell quotes several well-known writers on the subject including Scott Rifkin, Tom Ferguson and Deborah Dakins of the Telehealth Magazine.[14]

[13] Department of Industry Science and Tourism, Fragmentation to Integration, National Scoping Study: the Telemedicine Industry in australiam by John Mitchell of John Mitchell and Associates. Canberra, Australia, 1998.

[14] One study quoted is that undertaken by P/S/L Research a Montrreal company which we were unable to locate.

Mitchell also overviews the international e-health movement, and provides numerous examples from the USA in particular, again using short case studies to demonstrate the penetration of e-health, as he defines it. One striking example of the success of e-health cited by John Mitchell is the merger of Healtheon and WebMD to create a firm, which the creators announced, would be worth some US$20 billion.

In his final chapter, writing most enthusiastically about this 'unstoppable' industry, Mitchell provides some strategic directions for e-health in Australia. These include, disseminating information, promoting new business concepts incorporating e-health, the removal of barriers, and providing encouragement for e-health in the home and the use of the Internet for health information, and identifying industry leaders to champion e-health.

There are important similarities between the Australian and Canadian situation in terms of the telehealth industry. It is noteworthy that the *Industry Canada SCF definition of telehealth was designed to include within it, all of the applications mentioned by Mitchell in his study.* The contribution which Mitchell makes with his report is that telehealth and those applications more closely aligned with health and medical informatics should be considered as one and no longer be treated as separate, either as separate categories of telehealth, or as separate from the mainstream of health care, and health information.

In contrast to Mitchell's viewpoint, which takes an advocacy stand, and looks at e-health and telehealth from the inside of the health care system looking outwards, the WIT study reviewed below sees e-health from the outside, from the business perspective, and provides a wide range of facts and figures, financial data attesting to the growth of e-health as an industry in many different sub-sectors of the health economy.

E HEALTH 2000: HEALTHCARE AND THE INTERNET IN THE NEW MILLENNIUM

Wit Capital Research[15] produced a wide-ranging 69-page report on eHealth in January 2000. This report contains many tables and examples of e-health endeavors, mainly US based, and covers a large number of applications of e-health principally from the point of view of e-business and investment in health care. The report looks at e-health from the point of view of business and commerce rather than from inside health care. The text is divided into sections covering the following topics: Content, Community and Services; B-to-C Commerce; B-to-B Commerce; Connectivity and Applications: Attacking the Heart of health Care; and Beyond the 4 Cs.

> *With the same velocity that drove 50 million users onto the Internet in only five years (versus 13 for television and 38 for radio), the Internet is inspiring change in healthcare….. (p 3).*
>
> *We are extremely optimistic about the next generation of eHealth companies, which are improving upon existing business models through Web technologies (such as in genomics, clinical trials and disease management) as well as attacking entirely new market segments. (p 4)*

Millennium, January 31, 2000. Available at http://www.witcapital.com/research/researchbody.jsp?Report=ehlt_20000131

In the first section, the report shows that eHealth stocks are up 263% since the beginning of 1999, outperforming other Internet stocks, though the authors believe there will be a much clearer separation between winners and losers in the year 2000. Nonetheless, health continues to be one of the top three categories of Internet user interest and the authors believe this will only increase.

However, some of the Internet sites are still content poor and in order to attract larger bases of visitors they are turning to the portals, and major deals are being signed. Examples include DrKoop with America Online; and Healtheon WebMD with Excite, Lycos, WebTV and Microsoft Network.

In the B-to-C category, the authors see the biggest growth in online buying of products from pharmacies by consumers, part of $180 billion business in the US. In B-to-B commerce, focusing on business critical functions such as procurement, there is significant growth as well. Attractive markets include medical products – claimed to be a $150 billion market worldwide, with hospitals, physicians, and other healthcare facilities purchasing a variety of commodity and specialty medical products (p 25). However, the path to success is treacherous – trying to alter existing industry relationships remain complicated and the dynamics of purchasing in health markets have existed for decades with little innovation. There are entrenched players in these markets. Building critical mass early creates significant momentum and domain expertise is important. This has been demonstrated in the telehealth market in Canada, which is presently dominated by a few early entrants.

Healthcare is extremely transaction intensive and, in the US, it is estimated that between $0.25 and $0.40 of every dollar is spent on excessive administrative costs and duplication. In terms of front-end connectivity, the physician office accounts for approximately 20% or $215 billion of healthcare spending, and directs an even larger slice, perhaps another $600 billion in the US, according to the authors. While the numbers are certainly smaller, the Canadian situation may not be much different.

The WitCapital report states that EDI, in spite of being around for 20 years, has only modestly penetrated healthcare – (and this rings true for the Canadian situation). The barriers include lack of standards, fragmentation, costs of conversion and implementation, and industry inertia. The authors believe there is a much larger growth opportunity in adopting an IP environment instead of point-to-point EDI. The authors also see growth in mobile computing solutions for healthcare, though a number of hurdles remain including reliability, security, confidentiality and the need for change for change in provider behavior. The type of products and services which interest physicians, if provided over a secure network, are shown in exhibit one, taken from the WitCapital report.

In Beyond the Four C's section, the authors discuss disease management vs. health management in healthcare. Some companies focus on managing chronic and high risk patients with asthma, diabetes, heart disease and oncology. Disease management companies have not fared well in Canada (e.g. Telemedisys and Telemedicus) principally because of the difficulty in finding physicians willing to prescribe such monitoring and management systems. But increasingly health management companies, which focus on working with healthy individuals to develop wellness programs, are coming on the scene (in Canada

Infotech and Globalmedic are examples). Such companies continue to find it hard to identify paying customers. (p 46).

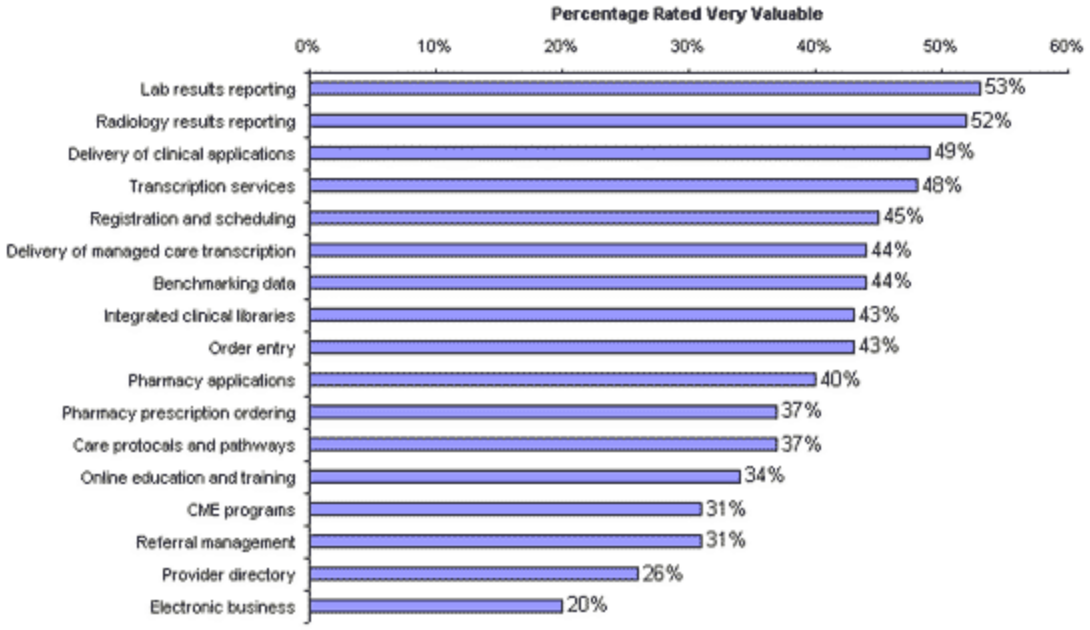

Exhibit One: Products and Services Perceived by Physicians as Valuable if Provided Over a Secure Intranet or Extranet (From the WitCapital report Source: VHA Annual Information Systems Survey 1998).

In their final section, the authors discuss telemedicine, and its recent growth, which has been stimulated by increasing demand and by declining costs. They believe that growth in telemedicine will continue because of more accessible broadband networks for large transmissions, the increasing support of government, and the increasing affordability of telecommunications. They also go on to note that teleradiology is the most common application, but radiology is extremely fragmented though it represents $69 billion in services in the US. The advent of web-based solutions that can send DICOM compliant radiology images to low cost PCs will see significant growth in the number of internet-based filmless radiology companies (in Canada as well as elsewhere).

CAPACITY OF CANADIAN COMPANIES TO RESPOND

As we searched the Internet and health and medical data bases, no Canadian companies appeared to have listed themselves as e-health companies. However, many companies in Canada have considerable experience and expertise in Electronic Health Records (e.g., Purkinje) and other e-health type applications. Several small Canadian companies have considerable experience in providing health information on the web (e.g. Globalmedic). Other companies which have been identified in

this profile fit Mitchell's definition of e-health by virtue of the type of product or service which they offer (Conceptis, Infotech, Digital Image FX). Indeed, these companies were considered part of the telehealth industry when research was first undertaken for the SCF. However, according to Dr Mo Watanabe, President of the Canadian Society of Telehealth (CST), the term e-health has not been popular in Canada due to fears related to commercialization of health information. The fear that the treatment of health and medical transactions by private companies will lead to breaches of confidential information by companies who could profit from such breaches (e.g. insurance companies) appears to be based on a highly publicized incident which was brought to the attention of health care providers and instilled a note of caution in their use of the terminology "e-health".

Whether it is through fear, ignorance, or lack of resources, it is clear that Canada is behind schedule in the adoption of the Internet and IP-based strategies for telehealth and telemedicine. If the use of the Internet, or if e-health (or whatever term is used to describe it) facilitates the integration of telehealth into the health care system as a whole, Canadians cannot afford to ignore this movement. One important strategy which would help Canadian companies might be to adopt any means to heighten the awareness of care administrators and providers through the deployment of information, demonstrations and other means to sensitize the health care sector to the advantages inherent in integrating telehealth and health informatics, to the precautions which are now enshrined in regulation, and to the many advantages and opportunities which IP-based networking can offer.

MAJOR CHALLENGES TO THE TELEHEALTH PRIVATE INDUSTRY

MULTITUDE OF PLAYERS INVOLVED

It is important to note that telehealth operations always involve a multitude of organizations. No telehealth system, even the most multi-functional, operates by itself or on a standalone basis. Telehealth systems are implemented in a federal, provincial, territorial or regional health care system, usually linking establishments such as regional hospitals and satellite clinics, or remote nursing stations to tertiary medical centres. In telecare applications, the equipment is installed in the home, but the receiving end is located in a hospital, a clinic or a call centre. The users of the equipment are health care professionals – physicians and employees of the health care system – and patients. The total system requirements therefore include end units (videoconference stations, multi-media units, medical imaging devices, monitoring devices and so on) and the means to facilitate communications: satellites, cable, microwave towers, telephone lines, wide area networks, local area networks, wireless networks, used in combinations to allow for real-time and store and forward communications. Software is required to transmit voice and data, to digitise and compress images, direct in real time, or store and forward multi-media content. Finally, some form of encryption may protect the content of the telehealth transactions. Thus it is impossible for one company, operating by itself, to install and operationalize a telehealth system anywhere in the world today. Many organizations, private and public, are involved.

COMPETITION FROM PUBLICLY-FUNDED ORGANISATIONS

History

Telehealth in Canada has its genesis in the post-secondary education and tertiary care centers in the late 1980's, early 1990's. But as early as 1959, Dr Jutras, a Canadian radiologist, transmitted radiologic images and performed remote control fluoroscopy. Although telemedicine experiments using terrestrial systems existed prior to the availability of communications satellites, a major catalyst for telemedicine development was the availability of the Hermes satellite for social experiments in the mid-seventies. Partly to justify the high cost of satellite development and partly to demonstrate its capabilities, the government of Canada sought the assistance of experimenters and scientists to help jump start the spread of telemedicine applications in Canada by providing time and space on communications satellites as well as funding for "social experiments" in health and education, using the satellites Hermes (for experiments) and later, Anik B (for pilot projects).

There were two major Canadian telemedicine projects using the satellite Hermes, one mounted by Memorial University of Newfoundland, and a second one at the University of Western Ontario. It was concluded that these experiments demonstrated the applicability of satellite communications to improve health care delivery, education and community development. In December 1978, the Anik-B satellite was launched, and pilot projects were solicited, to be facilitated by the availability of satellite time paid by the federal government. As this phase of satellite development was to precede sustainable and cost-recoverable satellite-based operations, there were only 2 or 3 telemedicine experiments undertaken.

Historically, then, whether it was to encourage satellite development or to test new telemedicine services and technologies, universities and research centers have been at the center of telehealth and telemedicine research and development. This trend has continued and in some cases, these publicly funded organizations have also become involved in marketing telehealth applications – possibly the result of the new need to raise revenues from telehealth activity to allow for cost-recovery. Today this situation is changing. More telehealth projects are being implemented because they respond to community needs, rather than from the need to test or justify new technologies.

Current Situation

There have been major efforts to bring together the private and public sectors to develop the telehealth industry in Canada. CANARIE, for example, has sought to organize workshops, seminars, and discussions in order to align the two components. Nonetheless, the efforts of Health Canada, reflecting the public sector's interests, and Industry Canada, reflecting private sector interests, are often happening on separate and parallel tracks. What is needed is good partnering to enable the joining of the two sectors in the use and deployment of telehealth.

In recent years, major cutbacks in Canadian Health Care budgets have provided the motivation for public sector organizations to engage in cost recovery activities. A number of examples exist in the tele-CME and tele-CHE sector. Our search of the various databases named above has turned up a

number of public organizations engaged in telehealth business. This trend is likely to continue, and leads the authors of this report to make the recommendation that Industry Canada take steps *to clearly distinguish on the CCC data base, publicly funded organizations as distinct from private companies engaged in similar businesses.* Although private companies need to partner with public organizations in order to implement telehealth successfully, they should not compete with one another for the same markets. It is plain that public organizations do not encounter the same challenges – and it should be clear that there is different role for both entities to grow a successful telehealth industry in Canada.

MEDICO-LEGAL AND ETHICAL CHALLENGES

Risks and liabilities

In recent years many reports and articles have discussed the subject of medico-legal issues involved in telehealth, yet the authors know of no incident, which has been brought to court in Canada, which might hinder the deployment or development of telehealth. However, the issue of medical responsibility and the specter of overly restraining legislation continue to loom large, and cannot be ignored.

A 1998 article on the subject of telehealth legal issues in Canada was published which overviews medico legal questions under the following headings: physicians (telehealth and the duty of care, telehealth and the standard of care), manufacturers and suppliers, hospitals, confidentiality of patient information, licensure, and Internet applications.[16] While some of the legal issues raised in this article by Domenic Crolla, a Canadian lawyer, are now being addressed in Canada and elsewhere, the article provides a useful overview of the legal issues involved in the practice of telehealth and telemedicine, many of which have a direct impact on telemedicine suppliers. For the authors, the primary question is: *who is at risk of legal liability in the practice of telehealth*? The author claims that the practice of telehealth challenges our traditional notions of the physician-patient relationships and goes on to raise questions about standards of care, informed consent, the extension of medical practice beyond provincial borders, and the limitations posed by the technologies used in telehealth, for example:

> "Telehealth makes it difficult, if not impossible, to alter the course of a procedure in order to address complications that may surface during surgery. Furthermore, in cases of remote care, the off-site physician can only see what is within the range of the on-site camera and microphones. . ….the telecommunication link may be disrupted or unexpectedly fail during the procedure, leaving the physician with a defective connection." (p. 6)

Some of these unanswered questions may act to inhibit the use of telehealth technologies by practitioners in Canada and therefore cannot be ignored. Of direct interest to telehealth suppliers are those questions related to equipment standards. As much of the telehealth technology was not originally designed for medical applications (e.g., videoconferencing), the author claims there may be virtue in ultimately classifying telehealth instruments as medical devices, leading to the establishment of clear standards for use. He concludes with a number of recommendations made to physicians and hospitals, which, if adopted, could only be of benefit to the industry in the mid and long term.

[16] Crolla, Domenic A., Health Care Without Walls: Responding to Telehealth's Emerging Legal Issues. Health Law in Canada, 19:1, pp 1-32, August 1998.

A report on Telehealth Risks and liabilities was provided to Health Canada's Advisory Council on Health Info-structure in December 1998.[17] Risks and liability issues were divided into 3 categories: delivery of services, delivery of information and the use of communications and information technology (See *Appendix One*). While these risks present some barriers to growth, others provide opportunities for implementing secure systems, encryption methods, and public key infrastructure models.

Reimbursement

It has often been stated that unless there is reimbursement or payment for practitioners using telehealth technologies, there can be no widespread adoption of telehealth technologies. This has so far been the case in Canada and the US. A background paper written by Pong, Hogenbirk and Pearson for the Advisory Council on Health states that:

> "The absence of policies regarding physician reimbursement for engaging in telehealth practice could stifle the development of telehealth. At present, most provincial health care insurance plans require that the patient be seen in person by a physician in order for a bill to be submitted by the physician. Because most of the current telehealth initiatives are pilot projects or clinical trials located at universities or hospitals, physician reimbursement has not been a major concern since most physicians involved treat their participation as research activities or because they are in alternative payment schemes (like salary or capitation). However, unless the reimbursement issue is appropriately addressed, it is unlikely that telehealth will be implemented on a broad scale. Physicians are unlikely to provide extensive telehealth services if they are not compensated, in one way or another, for their time and effort". (p3)

and

> "Unless there is evidence that telehealth will not lead to health care cost escalation, unless measures can be found to ensure proper utilization and unless physicians can be assured that telehealth will not pit one group of doctors against another, most third-party payers and medical associations are in no hurry to decide on reimbursement issues. Ironically, at this important juncture in the development of telehealth, we face a Catch-22 situation. Because of uncertainties and concerns about the impact of telehealth, many third-party payers, including provincial/territorial Ministries of Health, are reluctant to change reimbursement policies to fund telehealth. But unless telehealth is practiced in real-life settings and on a much broader scale, we will not be able to assess its impact and implications". (p 12) [18]

At the time of the writing the above-mentioned paper (January 1999), only one province had adopted a policy of reimbursement for telehealth providers. Now (March, 2000), four provinces – Nova Scotia, Manitoba, Saskatchewan and Alberta have adopted reimbursement policies for their

[17] Robinson, David M., TKY Group. Telehealth Risks and Liabilities: Policy Options for Removing Barriers to Growth. Submitted to the Advisory Council on Health Info-structure, Dec 1998.

[18] Pong, Raymond W., et al Telehealth and Practitioner Reimbusement Issues, Discussion paper for the Advisory Council on health Info-structure, January 1999.

practitioners, and, as expected, those provinces are currently amongst the most active in the use of telehealth technologies.

Licensure

Closely linked to the reimbursement issue is that of inter-jurisdictional licensing and telepractice issues. At first glance, the licensing of practitioners may appear to have little or no bearing on whether or not telehealth technologies are more widely adopted in Canada, since health care is a provincial matter. But the advantage of telehealth lies in the fact that it permits health care to be delivered anywhere, with no recognition of borders.

> "Two aspects of licensure are particularly important for telehealth practice: Qualification and locus of accountability. The former refers to the fact that if different jurisdictions impose divergent entry-into-practice requirements, it may be difficult for physicians with one set of qualifications to get permission to practice in another jurisdiction that has very different qualification requirements. The latter refers to the jurisdiction that has the ultimate authority to investigate and discipline telehealth practitioners when things go wrong or when patients lodge complaints." (p 4) [19]

In Canada a number of projects cross provincial borders. The Children's Telehealth Network originating in Halifax, uses telehealtah to link hospitals in 3 provinces. The Otttawa Heart Institute delivers medical services to Baffin Island via telehealth. A Western Canada alliance is under discussion and it may facilitate health care delivery across borders.

Recent discussions at the level of the World Health Organisation (WHO) focused on the problem of inter-jurisdictional provision of health care. Though it is tentatively proposed that practitioners of telehealth would be governed by the rules and regulations which apply to them in their own jurisdictions, there has been no official stance on this question. The term telepractice has been adopted more widely to cover the range of acts involved in medical and health care delivery practices over telehealth networks. In Canada the regulation of most health care professionals is a matter of provincial responsibility. Interprovincial and international telepractice almost certainly will require legislative change. [20]

Ethics: privacy and confidentiality

In December 1997, reacting to the overall concern expressed by citizens across the country regarding the threat to privacy and confidentiality posed by increased deployment of communications infrastructures and telehealth applications, CANARIE sponsored a conference entitled *Ensuring Privacy and Confidentiality on Canada's Health Iway*. In their report, privacy was defined broadly to mean personal data protection against misuse or abuse. Confidentiality was defined in the context of controlling access to information. Both these terms are linked to security, a set of safeguards in and

[19] Pong, Raymond W. et al Telehealth and Practitioner Licensure issues,

[20] Ronald S Sleightholm, from a paper given at Telepractice 2000, Toronto, Ontario May 1998

around an information system that protects access to the system and the information it contains. The purpose of security is to protect the system and the information it contains from unauthorized access and abuse. [21] This report is important to the industry in that it outlines some of the technological solutions required to ensure security, though it calls upon government to develop a system of public key infrastructures. This area is considered to be important to the Canadian industry because of the need for standards, and the potential for Canadian companies to develop and disseminate encryption tools.[22]

In regard to privacy protection, the Canadian Institute for Health Information (CIHI) has recommended that the Canadian Standards Association (CSA) Model Code for the Protection of Personal Information be adopted. The Canadian Organization for the Advancement of Computers in Health (COACH) has adopted a similar code.

Private industry suppliers of telehealth systems must become familiar with the principles which various organizations are adopting with reference to privacy protection and be able to ensure adherence to standards which will protect user privacy and confidentiality of transactions. These requirements have not dampened the enthusiasm for the adoption of telehealth, and indeed, have helped Canadian suppliers meet standards of security.

BUSINESS CHALLENGES: A SELECTION

There are many business challenges involved in growing a telehealth industry. A few of the most apparent from our interviews and review of the literature are briefly mentioned in this section.

ABSENCE OF COMPETITION; FRAGMENTATION

The number of companies involved in telehealth and telemedicine in Canada is so small that there is little competition. With so few players in the field, the Canadian scene telehealth purchaser could, conceivably, face a monopoly. Traditionally the absence of competition has the overall effect of stifling innovation. As has been demonstrated in the telco industry, the presence of competition has a major effect on price structures, driving them down for purchasers or consumers.

There is no distribution system and no ideal customer for a telehealth system: these systems are now sold to regional health authorities and ministries of health, and at times to faculties of medicine, hospitals and clinics, on the recommendation of the physician or specialists. Sometimes remote communities purchase the equipment. The vendor is left wondering where to place his or her marketing effort.

[21] CANARIE Inc, Ensuring Privacy and Confidentiality on Canada's health Iway, December 1997. Discussion Paper for the Advisory Council on Health Info-structure. January 1999.

[22] Further information is available from the online newsletter Observ@toire which is published by the telehealth ethics observatory at the Universite de Montreal and widely disseminated newsletter which covers issues related to ethics in telehealth.

With their proximity and their relatively large numbers of products and services, large US companies are well positioned to enter the Canadian telehealth market. The March/April 2000 issue of the Telemed-E-Zine from Feedback Research Services is devoted to telehealth and telemedicine in Canada, and its lead article states:

> "Not surprisingly, U.S. companies are targeting Canada as a viable market for telemedicine systems and supplemental medical devices. Reduced unit pricing for equipment and comparatively slow growth in demand for telehealth technologies in the United States during 1999 has led to increased vendor interest in Canadian projects, which appear to be well-funded and in the early stages of development. For example, up to $78.4 million U.S. in federal funding is expected to be provided through 2003 for telehealth ($115 million Canadian, based on March 16th, 2000 exchange rate)."

While more than half of the Canadian companies interviewed for this report stated they were exporting to the US, we did not interview any US telehealth companies who are exporting to Canada, except for Computing Devices Canada. According to the same FRS report cited above, "Corporate partnerships with Canadian companies are a key component for success, along with sustained attitudes among health care administrators that telehealth will ultimately save money and improve the quality of care". There have been attempts in the past by Team Canada to organize partnering events for health informatics companies (particularly through HIMSS). It might be advisable to organize similar partnering events in the field of telemedicine and telehealth.

PACE OF TECHNOLOGICAL CHANGE

Though all of the Canadian companies are integrators of existing technologies, the pace of technological change does affect their ability to roll out a product. It is well known that in order to remain on top of technological development and become a leader, significant amounts need to be invested in r&d.

The field of telehealth is a rapidly moving target in terms of technological change. Because of a resurging interest in distance telemedicine, the need for communications infrastructure – the lack of it, and the expense of it – is more than ever a technological challenge which can effectively prevent telemedicine from developing and expanding to those regions where it is most needed. To communicate with remote and isolated villages in many parts of Canada still requires satellite communications, complete with uplinks and downlinks and high bandwidth capability. Cheaper communications solutions must be researched and deployed. Wireless technologies and ASDL communications are still waves of the future for telemedicine because these too, require significant infrastructure development for their successful implementation.

There are developments for telehealth equipment as well. Smaller hand held digital cameras permit use of smaller desktop units capable of communicating using multiple protocols. But these in turn place new demands on communities for more bandwidth, multiple communication units or bridges (MCUs), and secure or private networks. New demands will be made for wireless communications and SDSL and ASDL connections for the faster multiple network utilization required of multimedia telehealth applications. However, large companies such as Newbridge are not necessarily developing

these solutions for the telehealth industry. We were unable to reach Newbridge for an interview, but this information comes from their web site: [23]

> The frustration experienced by remote workers trying to connect to corporate networks at 56 Kb/s is real. The problem is magnified when numerous connections are being made from a single location. With SDSL, service providers can now offer T1 (1.544 Mb/s) or E1 (2.048 Mb/s) services for just about the same capital cost of 56 kb/s leased lines or frame relay connections.
>
> SDSL technology provides a symmetric link to data networks for residential and business users. Using a single pair of copper wires, SDSL extension technology can be used to tranport multiple service such as private line services, digital voice transmission, IP or frame relay.
>
> According to market forecasts by organizations like the Yankee Group, within three years more than 80 percent of access lines will run at speeds ranging from fractional T1/E1 to full T1/E1.
>
> The Newbridge SDSL solution uses multirate transmission technology to provide symmetric bandwidth that is ideal for today's business needs. MultiMate SDSL, a natural evolution of SDSL, is a system that uses multiple line rate speeds; therefore optimizing reach for any given bit rate.
>
> And, regarding ASDL:
>
> Increasingly, service providers are being asked to provide one-stop shopping for all enterprise and consumer communications requirements. These requirements range from high speed Internet access to teleporting, including various multimedia and entertainment services. At the same time, customers expect the same levels of performance and reliability that they have come to expect from their existing networks, and at a lower cost. Faced with these customer requirements, the balance shifts in favor of the provider that can deliver the services required as quickly and as cost-effectively as possible, while at the same time adapting to ever-changing technology evolution and market pressures. An effectively integrated, multiservice network ensures that these requirements can be met.
>
> The concept of a multiservice network is simple: integration of all traffic types onto a single core network allows significant savings, creates network efficiency, and is inherently flexible. A successful implementation of a multiservice network is more complicated. A wide array of integrated value-added services and applications characterize the Newbridge ADSL solution, allowing service providers to deliver these services to market quickly -- with no need for new overlay networks. ADSL gets services economically to end customers at smaller sites and home locations.

NO ECONOMIES OF SCALE

In Canada, health is a provincial matter. The telehealth vendor may be able to sell technology in one province but an entirely different technology and infrastructure will be present in other regions and provinces. In the past, the federal government commanded a certain power of purchase because of

[23] See http://www.newbridge.com

its mandate to provide health care services to First Nation communities. With the federal government divesting itself of the management of health care for First Nation communities, however, sales of these technologies are negotiated province-by-province and even region-by-region, community-by-community. This affects the price of development and deployment of telehealth technology.

LACK OF INTEGRATION INTO HEALTH CARE SYSTEM AS A WHOLE

Health care administrators and practitioners are more concerned than ever before about the lack of integration of telehealth networks and the health care system. This subject is covered in some detail in the Mitchell report *Fragmentation to Integration: The Telemedicine Industry in Australia.*

Though tremendous strides have been made in developing interoperable standards for telehealth equipment, there still remains the problem inherent in integrating the equipment in the fabric of the health care system as it is practiced.

In the final analysis, telehealth, if it is to work effectively, causes organizational change. One of the side effects is the changing role of providers and caregivers, sometimes posing a threat in that existing referral patterns between patients and providers are changed. These changes threaten professionals but may, in the long term, prove beneficial to both providers and their patients.

NEED FOR EDUCATION INCLUDING TRAINING TO USE TELEHEALTH

A recently conducted review of telemedicine and telehealth literature reveals a large number of articles which mention the need for rigorous evaluations, the problems associated with medico legal issues, and the number of times barriers to adoption and implementation are mentioned.[24] Few authors admit that the technologies, the choices, the implementation issues, the consequences, and the applications have become so numerous and complex that indeed, there is an urgent need for training and education in telehealth technologies, implementation and practice.

One exception, an excellent paper about the reliability of telemedicine examinations, reported how patients were examined both conventionally and by telemedicine in 12 clinics. 1826 matched pairs of observations were compared. The authors found that clinicians without experience or knowledge of system limitations missed findings of clinical importance, raising doubts about the reliability of occasional telemedicine consultations by clinicians inexperienced in the technology - which is a key factor in many telemedicine practices today. The authors also found that "instrumentally-dependent modes of examination may have provided high-quality sound and images, but suppressed findings of clinical importance, resulting in false-negative findings. Then they discovered that manipulation of equipment settings enabled detection of all important abnormalities. The authors conclude, "these issues should also be considered for training and quality improvement programming within academic medical centers that sponsor telemedicine programs".[25]

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[24] Picot, Jocelyne: Towards a Methodology for Developing and Implementing Best Practices in Teleheatlh and Telemedicine, in Nerlich, M and Krestchmer, R, eds: The Impact of Telemedicine on Health Care management. IOS Press, Amsterdam, 1999, pp 23-28.

[25] Nitzkin et al, Reliability of Telemedicine Examination, Telemedicine Journal, 3:2, 1997, pp 141- 157.

By contrast to the above, a recently published empirical study on telepathology based on 2200 cases shows how increasing use of a telepathology system decreased case turnaround times from 2.46 days to 1.5 days, without any drop in the level of accuracy. [26]

A quick survey of what is available in terms of educational and training programs for telehealth users in Canada reveals that there is little available beyond what the vendor provides. A growing number of specialists and general practitioners adopting these technologies are learning the hard way - on the job.

Telehealth is used in a number of sub-sectors and specialties, technologies, applications and systems. There are some who will argue that telemedicine is only a tool, not a new practice, and that we are not moving from one type of medicine to another, but just to a different form of transportation or communication, no different from a telephone consultation. Perhaps one day, telehealth will be as easy as using the telephone. Until then, this technology is not transparent. The user has much to learn before implementing and using these technologies. Far from being a simple extension of the current health care system, a multiplicity of compatibility and interoperability issues along with terminology and interfaces confront the potential adopter even before the equipment is in place.

STRENGTH AND WEAKNESSES OF CANADIAN TELEHEALTH COMPANIES

It is hardly possible to draw firm conclusions from such a small sample of interviews. However, the material overviewed for this report provide ample evidence that the Canadian telehealth presence is weaker, comparatively speaking, than counterpart industries in other developed countries such as Australia, Europe, Scandanavia, and the U.S.

Annually, the Telehealth Magazine publishes a list of the top ten telemedicine programs in the US. Its most recent list (1999) provides some interesting insights into the secrets to their success, and some of the same lessons apply to the Canadian situation:

> "More and more telemedicine programs are demonstrating the ability not only to survive but to grow and prosper. Business models have become more refined, technologies easier to use, clinical outcomes and cost savings better documented, and faculty and administrators increasingly convinced that telemedicine offers substantial benefits.
>
> Additional strengths helped this year's winners to stand above the rest: Each was established to meet specific needs within the communities it serves. Each has created a stable support system for its programs, most often through multiple financial resources and a dedicated team of medical, technical, and administrative personnel. Most are also embracing cutting-edge technologies and understand that, in today's healthcare environment, clinical applications—even those used to treat patients remotely—need to be integrated into an enterprise-wide healthcare information system.

[26] Bruce e Dunn et al, Routine Surgical Telepathology in the Department of Veterans Affairs: Experience-Related Improvements in pathologist Performance in 2200 Cases. *Telemedicine Journal* 5:4 pp 323-337. Winter 1999.

Programs were initially considered for Top 10 status only if they met the following criteria, which we use each year to identify potential candidates:

- Fills a defined clinical or healthcare delivery need;
- Is self-supported or sustainable;
- Organizational support is evident;
- Service is accepted by physicians and patients; and
- Costs and outcomes are measured." [27]

In addition to the criteria mentioned above, Telehealth Magazine has added two more considered by them to be most important. One is that the telemedicine system use desktop PC technology, at least in part, and secondly, that the program's results be the subject of publications or conferences.

Other success factors have frequently been mentioned in the literature. They include:

- Providing **adequate training and follow-up help**, as close as possible to the user;
- Integrating the telemedicine technology in the health care organization and system as a whole – and more and more this means finding and implementing **interoperable solutions which adhere to standards**, and achieving a successful marriage between healthcare informatics and telematics;

Using these criteria along with insights drawn from the interviews and from comprehensive literature reviews, Canadian telehealth programs and the companies involved can be scrutinized to highlight what are their comparative strengths and weaknesses.

In terms of telehealth companies generally, some additional success factors need to be included. A number of companies have come and gone in the last few years, and **finding stable financing** has often been the most important insurmountable challenge facing these companies. Canadian telehealth companies are small, privately owned, and fragile because they must often survive on the basis of projects rather than long-term commitments from government purchasers. Telehealth projects in Canada are often exactly that – projects – and not long term sites or installations. At the end of the project, the company is left without its most important client. Several companies have floundered on the rocks of such unstable conditions.

In spite of stable financing, companies may flounder because they have not renewed their commitments to the communities they serve or kept pace with technological change. Keeping pace with **technological change** is inextricably linked to the need for stable financing. In this regard, Canadian companies that are capitalizing on web fever and developing IP-based tools are meeting with success: GlobalMedic and Conceptis are two such companies.

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[27] Kincade, Kathy, Top Ten Telemedicine Programs for 1999: Experience Pays Off. Telehealth Magazine http://www.telemedmag.com/current/feature.htm. March 2000.

Several companies have found that their technological solutions no longer meet the exigencies of the health care system. For example, companies with proprietary standards need to shed these protocols to go to interoperable systems embracing universal standards. However, since there are few well designed standards available (the ACR DICOM standard stands out as an exception), companies must seek to be as flexible with their solutions as they can possibly be. A proprietary standard will not guarantee success, and indeed may close off prospects for implementing telemedicine and telehealth into the context of other systems.

There are several examples of the need to keep pace with change associated with medical videoconferencing. Videoconferencing is the basis for many applications in telehealth today: telepsychiatry and mental health, CME and CHE, to name but a few. Large, room-based systems have given way to small desktop units permitting interactivity with users. If necessary, the images, if of sufficiently high resolution, can be projected on large screens. The debate for standards in videoconferencing is far from resolved. Standard educational videoconferencing equipment may not necessarily meet the need. Telemedicine units must be capable of securely transferring data from multiple sources in multiple formats, including medical images with high resolution. Systems which rely exclusively on the H.320 protocols, for example, and do not incorporate the H.323 standard, are finding that compatibility is a problem. Thus the e-health solutions mentioned earlier need to be pursued diligently by Canadian companies if they are to keep pace with videoconferencing technology.

In the category of telemedicine, one Canadian company, TecKnowledge, is frequently cited for its success in meeting the needs of its clients, and in striving to integrate their telemedicine solutions within the health care organization as a whole, as well as providing a well rounded package of pre-installation user training and after-care. TecKnowledge has also gained an enviable reputation for being well financed, and for concentrating their efforts on the Canadian health care scene, which they know best.

With the advent of health care reform, and cutbacks in the number of hospital beds combined with an increasingly ageing population, Canadian **telecare and telemonitoring** companies, the newest entries into telehealth (few such companies were viable at the time of researching and writing the SCF) appear to be the most successful in terms of current sales and projected revenues. The Telehealth Magazine article cited earlier found that, in telemedicine, successful programs meet community needs. Clnidata is one triage and call center company which attends to community needs and has found success in meeting these needs in rural and remote communities partly through sound employee training.

To achieve true success, companies must increase both their domestic and **export** sales. The telemedicine companies we interviewed are not active outside Canadian borders. Only two reported export revenues. This could be a feature of the overall immaturity of the field and may correct itself over time because many of the companies have identified future export markets they would like to enter. As for the two categories – telelearning and telecare – practically all the companies are exporting.

The **r&d** activities of the companies interviewed seem to be confined to research associated with setting up a new company, or market research. The companies interviewed, even the larger ones, are not undertaking in-house telehealth technology r&d on any significant scale. In Canada, telehealth r&d investment has been spotty – most of it in the area of applied and developmental research

funded by CANARIE or Health Canada. A long-awaited call for new proposals, expected earlier this year, or even in 1999, has not yet been announced by Health Canada, leaving many institutions and private companies wondering about future funding of telehealth experiments in Canada

Most of the Canadian telehealth companies are too small to undertake significant r&d efforts on their own. In some cases they have partnered with local universities. However, the field of telehealth being relatively cross-disciplinary, few, if any, universities have laboratories or departments dedicated to research in telehealth. Exceptions may be the Imaging laboratory at UBC. Other universities engaged in research (Universities of Alberta, Calgary, Dalhousie, Laurentian, Laval and Montreal) are concentrating their efforts on evaluation research rather than on new technological breakthroughs in telehealth. To our knowledge, no private research centers, with the exception of MacDonald Dettwiler in Alberta, have devoted significant resources to telehealth technology research.

Many reports contain the recommendation that there be more investment in r&d in Canada. This is also true for telehealth – however, telehealth r&d requires the development of new technological solutions to problems identified earlier – including higher and cheaper bandwidths and secure and confidential communications, along with robust, portable multiple-task end units. Small companies working in isolation cannot develop these devices. Good partnering is needed with universities and research centers.

But partnering is also needed at other levels – as mentioned earlier, a multitude of players, private and public, is engaged in successful telehealth deployment. Solid partnerships with the public component of the telehealth industry smoothes the way to well adapted solutions. On the international scene, the Canadian health care system is well regarded. Partnering with the public institutions would likely help raise the profile and enhance the image of our small telehealth industry abroad.

CONCLUSIONS AND RECOMMENDATIONS

Throughout this report, the authors have exposed the problems, issues and challenges and hinted at actions which might be undertaken by government to bolster the telehealth industry in Canada. The following paragraphs highlight these challenges and provide suggested strategies or recommendations to rectify or address the problem.

1. It would be an understatement to say that Canadian telehealth companies are falling behind the US and other developed countries in their ability to keep pace with technological change. This could be because there is little r&d taking place, which means innovation is at bay. *The telehealth industry needs an injection of r&d funds in order to address the special technological and telecommunications needs of remote communities in particular.*

2. We have shown throughout this report, that partnerships - between companies offering complementary services and products as well as between organizations in the private and public sectors - are essential to successful implementation of telehealth. Solid partnerships with the public component of the telehealth industry can smooth the way to well adapted solutions. As well, on the international scene, the Canadian Health Care system is well regarded. Partnering with the public institutions would likely help raise the profile and

enhance the image of our small telehealth industry abroad. The Canadian Society of Telehealth (CST) is unique in that it embodies members from the private and public sectors representing the telehealth industry. *The CST is one vehicle that can be used to create partnerships. Industry Canada might also encourage the creation of business networks and organize partnering events and seminars focused on creating alliances, joint ventures, consortia and the like.*

3. Partnering might also dilute conflicting interests and reduce competition between the private and public telehealth sectors. Publicly funded organizations are increasingly selling their wares nationally and internationally. On the CCC database, many of the organizations listed are public. These organizations do not face the same bottom line pressures as private companies and may have less overhead. Though private companies need to partner with public organizations in order to implement telehealth successfully, they should not compete with one another for the same markets. *Industry Canada needs to take steps to clearly distinguish on the CCC database, publicly funded organizations as distinct from private companies engaged in similar businesses.*

4. According to the interviewees, only one Canadian company has significant telehealth operations outside of Canada. There are several strategies that can be developed to assist companies who wish to increase their exposure to other markets. Partnering events have been held outside Canada by HIMSS but may not have targeted telehealth companies. A more suitable venue is the American Telemedecine Association or the Association of Telemedicine Service Providers in the US. *Team Canada site visits, such as those already undertaken which include telehealth companies, need to be more targeted to this industry. Showcasing companies in other countries by helping them to exhibit at trade shows are only two of the actions which might help Canadian telehealth companies.*

5. The new "buzz-word" is no longer videoconferencing, or even telehealth or telemedicine, but rather **e-health**. This term is being used to describe two different sets of activities: one which relates to e-business generally, and the other which relates to a collection of electronic healthcare activities, previously described in categories two and three of the SCF telehealth report. The advent of e-health and all that it brings is affecting very seriously the telehealth industry world-wide and Canada is no exception. The Canadian telehealth industry is only slowly taking up the challenge of e-health in all its dimensions. The fear that Canadians seem to have is related to a narrow definition of e-health and this could only be dispelled by education and information. *Industry Canada might assist the industry to rapidly enter this new field by helping the telehealth e-health sub sector associate itself with the successful e-commerce sector in Canada. Seminars and conferences organized by Industry Canada would also be of benefit.*

6. A new type of tele-care service has sprung up recently, the so-called self-care services using telematics technologies. An informal survey undertaken by Health Canada reveals sixteen active or planned projects in this area, involving three private companies, only one of which has been interviewed for our profile (Clinidata). Companies who have failed in the home telecare business in Canada were unable to convince physicians to prescribe home telecare and telemonitoring devices or services – which is necessary in order to get health insurance companies to pay for it. *In this case, the facilitator of this type of innovation is the physician – as he or*

she prescribes, it will be adopted. If not, it remains on the shelf. Perhaps the simplest strategy would be to adopt any tactic that will woo the physician.

7. As most telehealth technology was not originally designed for medical applications (e.g., videoconferencing), there may be virtue in ultimately classifying telehealth instruments as medical devices, leading to the establishment of clear standards for use. *Industry Canada might work with the Medical devices branch of Health Canada to make this happen.*

8. Some provinces have solved the medical reimbursement fees for medical doctors offering advice online. There are still some problems associated with practicing beyond provincial borders. Though it is tentatively proposed that practitioners of telehealth would offer consultations and services under the rules and regulations which apply to them in their own jurisdictions, there has been no official stance on this question. *The input of medical associations and bodies is needed to solve this jurisdictional problem. Once again, the CST might be the appropriate body to facilitate discussions.*

9. Some authors indicate that the technologies, the choices, the implementation issues, the consequences, and the applications have become so numerous and complex that indeed, there is an urgent need for training and education in telehealth technologies, implementation and practice. *Industry Canada might encourage, by various means the creation, the development and the offering of courses in telehealth.*

10. There is considerable confusion over the market figures which have been published over the last few years predicting or estimating the size of the telehealth and telemedicine markets, both domestically and world-wide. This confusion arises out of what is considered to be telehealth – and what expenditures should be included in each of the market segments. *It is recommended that Industry Canada undertake a survey to determine more precisely what is the size of each market segment, especially in light of technological changes since the publication of the Service Growth Report two years ago.*

11. Most of the Canadian telehealth companies are too small to undertake significant r&d efforts on their own. In some cases they have partnered with local universities. However, the field of telehealth being relatively cross-disciplinary, few, if any, universities have laboratories or departments dedicated to research in telehealth. Exceptions may be the Imaging laboratory at UBC. Other universities engaged in telehealth research are concentrating their efforts on evaluation research rather than on new technological breakthroughs in telehealth. *Governments need to provide additional investments in r&d under conditions which are more favourable and long term for the telehealth industry than what is presently available.*

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