

**Department of Communications**

**USES OF TELECOMMUNICATIONS WITHIN  
THE HEALTH CARE SYSTEM**

A report from

**Woods Gordon**

Management Consultants

QUEEN  
P  
91  
.C655  
R52  
1984  
v.1





Government of Canada  
Department of Communications

Gouvernement du Canada  
Ministère des Communications

Queen  
91  
C655  
R52  
1984  
v.1

Your file    Votre référence

Our file    Notre référence

DOC CONTRACTOR REPORT

DOC-CR-84-014

DEPARTMENT OF COMMUNICATIONS - OTTAWA - CANADA

<sup>(2)</sup>  
TITLE: / USES OF TELECOMMUNICATIONS WITHIN THE HEALTH CARE SYSTEM /

<sup>(1)</sup>  
AUTHOR(S): / LES / RICHMOND, B.A.Sc., M.D.  
RICHARD BLANCHARD, C.M.C.

ISSUED BY CONTRACTOR AS REPORT NO:

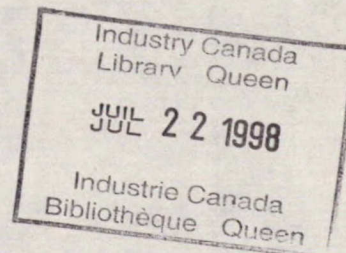
CONTRACTOR: WOODS GORDON MANAGEMENT CONSULTANTS

DEPARTMENT OF SUPPLY AND SERVICES CONTRACT NO: OST 83-00003

DOC REQUISITION NO: 36100-2-4439

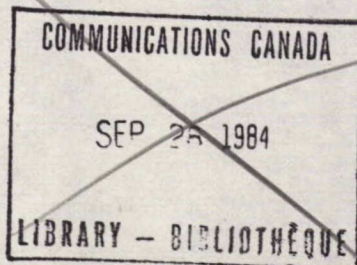
DOC SCIENTIFIC AUTHORITY: D. WAUNG

CLASSIFICATION: UNCLASSIFIED



This report presents the views of the author(s).  
Publication of this report does not constitute DOC  
approval of the report's findings or conclusions.  
This report is available outside the Department by  
special arrangement.

DATE: MARCH 1984

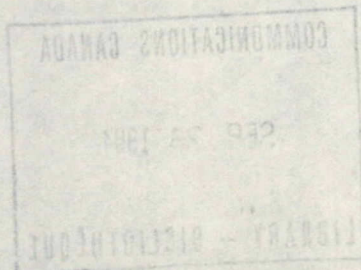


Canada



P  
91  
C655  
R52e  
1984  
V.1

DD 4787953  
DL4787972





A MEMBER OF ARTHUR YOUNG INTERNATIONAL

## Woods Gordon

Management Consultants  
P.O. Box 251  
Royal Trust Tower  
Toronto-Dominion Centre  
Toronto, Canada M5K 1J7  
Telephone: (416) 864-1212  
Telex: 06-23191

February 28, 1984

Mr. David Waung  
Satellite Applications Systems Engineer  
Space Communications Planning  
Department of Communications  
Journal Tower South, 9th floor  
365 Laurier Street West  
Ottawa, Ontario  
K1A 0C8

Dear Mr. Waung:

### USES OF TELECOMMUNICATIONS WITHIN THE HEALTH CARE SYSTEM

We are pleased to submit our report on the above subject.

As indicated in the report, there is great interest in telehealth in the health care industry and we have benefited from the advice of many of those involved in the field.

The future of telehealth depends upon the degree to which the major participants in health care can be persuaded to work together for mutual benefit. The Department can materially assist the process in a number of ways as outlined in our recommendations.

Yours truly,

Woods Gordon

DEPARTMENT OF COMMUNICATIONS

USES OF TELECOMMUNICATIONS WITHIN THE HEALTH CARE SYSTEM

TABLE OF CONTENTS

	<u>PAGE</u>
Letter of Transmittal	
Executive Summary	
1. Introduction	1
1.1 Definition of Terms	1
1.2 Background	2
1.3 Study Objectives	4
1.4 Study Scope	4
2. Approach and Study Methodology	6
2.1 Approach	6
2.2 Study Methodology	7
3. Current Applications and User Needs	15
3.1 Description of the Health Care System in Canada	15
3.2 Current Uses of Telecommunications in Health Care	17
3.3 Summary of Survey of User Needs for Telecommunication	28
3.4 Summary of Findings from Data Collection	33
4. Development of System Concepts	39
4.1 General Approach	39
4.2 Communication Matrix	40
4.3 Application and Technology Matrices	41
4.4 Selection of System Concepts	41
5.1 Data Networks	43
5.1.1 Example	43
5.1.2 Canadian Prototype	44
5.1.3 Market	46
5.1.4 Costs	46
5.1.5 Benefits	47
5.1.6 Organization	48

	<u>PAGE</u>
5.2 Regional Networks for Health Care Delivery	48
5.2.1 Example and Canadian Prototype	48
5.2.2 Narrowband vs Broadband	49
5.2.3 Markets	50
5.2.4 Costs	51
5.2.5 Benefits	51
5.3 Audio Teleconferencing	52
5.3.1 Example and Canadian Prototype	52
5.3.2 Markets	52
5.3.3 Costs	53
5.3.4 Benefits	53
5.3.5 Organization	54
5.4 Cable Networks	54
5.4.1 Example and Canadian Prototype	54
5.4.2 Markets	55
5.4.3 Costs	55
5.4.4 Benefits	56
5.4.5 Organization	58
6. Costs and Benefits	59
7. Regulatory and other Barriers	62
7.1 Structure	62
7.2 Major Participants and Their Market	63
7.2.1 The Carriers	63
7.2.2 Basic Services	65
7.2.3 The Regulatory Environment	67
7.2.4 Selected Issues	69
7.2.4.1 New Technologies	69
7.2.4.2 Licencing of Earth Stations	70
7.2.4.3 Vertical Integration	71
7.2.4.4 Terminal Attachment	72

	<u>PAGE</u>
7.3 Regulatory and Other Barriers to Telehealth	73
7.3.1 Data Networks	74
7.4 Regional Networks	75
7.5 Audio Teleconferencing	76
7.6 Cable Television	76
8. Recommendations	78
8.1 Coordination of activities	78
8.2 Creation of national databases	79
8.3 National standards	80
8.4 Dissemination of information	81
8.5 Funding	82

LIST OF EXHIBITS

<u>Exhibit</u>	<u>Title</u>
1	Definitions of Telemedicine
2	Study Flowchart
3	Telidon Projects
4	Distribution of Interviews by Profession
5	Needs Identification
6	Communication Matrix
7	Application Matrix
8	Network of Health Care Facilities
9	Sample Applications
10	Costs and Benefits
11	Major Participants
12	Major Canadian Telecommunication Arteries
13	Overview of Telecommunication Services and Carriers
14	Major Telecommunication Carriers and their Regulatory Agencies
15	Regulatory and other Barriers



## DOC TELEHEALTH

### EXECUTIVE SUMMARY

For the purpose of this study, we have used "telehealth" to mean the application of any telecommunication medium in the support of the full range of health care activities such as medicine, dentistry, nursing, or other health professions. We have considered land based systems such as telephone, cable, data networks, and audio teleconferencing as well as potential satellite communication media.

During the past decade in Canada, there has been a very rapid development of the telecommunications industry and its application to everyday life. This rapid change has provided opportunities for the development of many telehealth applications. To date, many of these developments have been stimulated by programs of the federal government including the space program and the Telidon program. There have been numerous experiments and field trials which have demonstrated the potential of communications technology to enhance the delivery of telehealth services. The Department of Communications (DOC) now wishes to identify current needs for telehealth services in Canada and to explore methods of extending the potential of modern communications to the health care system on a much wider scale.

In May of 1983, we were retained by the DOC to undertake a review of current uses of telecommunications and health care in Canada. The objectives of this review were as follows:

- o to prepare a summary description of the health care system in Canada;
- o to provide a survey of current telehealth projects in Canada and other countries;
- o to indicate future system concepts which might be developed in Canada;
- o to identify high priority areas for further investigation; and
- o to prepare a report outlining our findings and recommendations.

#### Study Methodology

The study consisted of six broad tasks. In task 1, we conducted a complete analysis of the Canadian health care system as it relates to future telehealth needs. This analysis was based on a broad review of available secondary sources and the previous experience of the health care group within Woods Gordon. In this task, we reviewed the roles of various governments and associations in the health care system, the financial structure of the health care system, operational procedures, and statistical data which is pertinent to telehealth.

The second task included a summary review of existing uses of telecommunications in health care. It was composed of a literature search, input from associates, secondary unpublished materials, and interviews with key knowledgeable individuals. Following this data collection, we prepared a bibliography of current telehealth articles and a summary description of current telehealth applications in Canada and the United States.

In task 3, we conducted a survey of professional associations (hospital, medical, nursing), government agencies, provider agencies, and potential suppliers of telehealth services. We

also surveyed individuals with known previous experience in telehealth. This survey complemented our review of existing uses of telecommunications and also served to identify potential needs for telehealth services.

In task 4, we identified system concepts which had the highest potential for future applicability in Canada and developed a preliminary review of the potential costs and benefits of these system concepts. These systems were developed by first constructing a comprehensive matrix of potential senders and receivers of telehealth services and the nature of the message being transmitted. This matrix was then condensed to provide a description of potential markets for telehealth services for each of the four categories of potential telehealth application. The individual intersections or nodes of this matrix were then described in greater detail to include a general description of the telehealth service, potential consumers, potential providers of service, an estimate of the market size, current delivery techniques, alternative delivery methods, and likely future delivery methods. This application matrix was then further analyzed and judgements were developed as to the relative cost, reliability, simplicity, performance, and potential impact on health care in Canada of each of the applications identified. Based on these judgements, four general system concepts were identified which we believe have the most promise and should be investigated further.

In task 5, we reviewed the regulatory environment as it relates to telecommunications in general and telehealth in specifics



and some of the other non-legal barriers to the introduction of telehealth services.

Finally, in task 6, we developed recommendations for further action and drafted a report outlining our findings and recommendations.

#### Description of the Health Care System in Canada

A review of the health care system in Canada was undertaken with a view to providing the uninitiated with some appreciation of the history and scope of the system and to provide a basis for estimating the need for telehealth services. A few salient features stood out and are summarized below:

- the health care system is regulated by a patchwork of federal and provincial legislation which provides for federal cost sharing subject to certain minimum standards including: portability across provinces, reasonable access, universal coverage, comprehensive coverage, reasonable compensation for providers, uniform terms and conditions, public administration on a non-profit basis. The commitment to reasonable access provides an impetus to use telecommunications to provide health services to northern and remote communities which cannot be supported through existing means.
- the federal contribution to overall health care costs is approximately 50%. Health and Welfare Canada contributions through cash payments and tax transfer will be 9.4 billion dollars in 1983/84. These statistics would indicate that the health care industry in Canada is substantial and would provide an important market for telecommunication services.
- under the British North American Act, the provincial governments have primary jurisdiction over almost all health services. Therefore, the responsibility for the regulation of health care, the operation of health insurance plans, and the direct provision of most health services rests with the provincial governments. The federal government has responsibility only for very specific areas of service of national concern: health service for natives, penitentiary inmates, armed forces personnel and veterans. Because of this, most telehealth projects will need to be initiated and supported at a provincial level except in those areas, listed above, where the federal government has principal responsibility.

- many of the provinces have a regional office structure under their health department - for example, the Ministry of Health of Ontario has established District Health Councils to encourage regional planning for health services. Because of this regional orientation telehealth programs for the support of health care delivery need to be developed in close cooperation with these regional bodies (where they exist) and telehealth programs should serve to strengthen these regional networks.
- the health care system is dominated by the institutional care component (including hospitals, rehabilitation treatment centres, mental retardation facilities, etc.) which utilize the lion's share (approximately 53%) of health care expenditures. Hospitals tend to be the single largest and most influential health care provider in any community. It is understandable then why many of the existing telehealth projects involve the linkage between hospitals in urban and rural centres.
- the most influential health care providers are the physicians who are the "gatekeepers" to the system and the nurses who are the major care givers. There are approximately 42,000 physicians and 200,000 nurses in Canada. Programs for professional education will therefore tend to be directed initially to physicians and nurses.
- approximately 56% of the population of Canada is in metropolitan areas and these are mainly confined to areas adjoining our southern border with the United States. Therefore, the principal markets for public health education and continuing professional education are also located in these centres.
- there are marked variations in the utilization of health care resources between provinces and between southern urban areas and northern rural areas. This is thought to be mainly due to differences in the supply of health care providers. This disparity is expected to continue in the future despite various government incentive programs. Telehealth programs therefore provide an important alternate means of satisfying some of the current and future health care needs of people in rural Canada.
- the relatively low population density of northern and remote areas of Canada cannot possibly justify the same level of specialist support and specialized high technology diagnostic equipment that is available in the major urban teaching centres. Therefore, there will always be a need to develop telecommunications techniques to make these services available to those who require them.

- the proposed Canada Health Act is not expected to impact on telehealth developments except insofar as it limits the sources of funds available to provincial governments to introduce new services.

#### Current Uses of Telecommunications in Health Care

In Canada, the development of telehealth programs has developed in three stages:

1. The first stage was characterized by early experimentation by "champions" who recognized the value of telecommunications technology in support of health care delivery needs.
2. The second stage was prompted by infusions of federal and provincial funds for experiments and clinical trials.
3. The third phase has witnessed the privatization and proliferation of telehealth programs from the early sentinel telehealth projects to a larger national market.

From early telehealth experiments, a few tentative conclusions were reached:

- A dependable reliable and high quality telephone service is fundamental to the health care system.
- The cost of providing broad-band services to northern hospitals and the allied telecommunications equipment used at remote nursing stations was prohibitively expensive.
- The continuing education needs of health professionals could be adequately met and at considerably less cost by audio teleconferencing with the pre-circulation of visual aids rather than the use of one-way or two-way video conferencing.
- Finally, most of the telehealth needs could be met using conventional terrestrial telephone links.
- They demonstrated that satellites can be used to provide telehealth services; however, the costs are high and these services can only be cost justified if they support a large user community. In the Canadian context, this means the shared use of these systems with other education and social services applications.

#### Telehealth Trends

From our review of the past history of telehealth in Canada and the United States, a number of significant trends emerge:



- the slow transition from government funded clinical trials to products developed by the private sector for a mass market is expected to continue.
- the strong interest in the private sector in getting into the telehealth market at the ground level. There is a rush by hospitals, government agencies and private companies to get an early foothold in what is seen as an important and lucrative market.
- products which are being developed are those which demonstrate commercial viability or receive a commitment from government for long-term support.
- there is a large and slowly growing cadre of people in Canada who are knowledgeable about the capabilities of telehealth. These people are taking an active role in diffusing telehealth information to a broader end-user audience and stimulating a user demand for services.
- future telehealth applications will involve combinations of different technologies to provide products matched to user needs. For example, the various links in regional networks being developed for health care delivery to northern and rural communities employ a variety of narrowband and broadband technologies to match the needs and available resources for each link in the network. Similarly, data networks are using various combinations of packet switching, broadcast and cable television, videotext and personal computer technologies to produce total systems that are inexpensive and simple to use.
- telehealth continues to be caught in a perpetual chicken and egg dilemma: many applications are not cost-effective unless they are provided to a mass audience; however, there is no mass audience for many telehealth applications because they are not cost effective. If this cycle can be broken either by reduction in the costs or the provision of a large consumer market, then there is a potential for a very rapid growth in market demand for telehealth services.
- whereas previous telehealth applications were technology driven with solutions looking for problems, current approaches focus on user needs and finding the optimal mix of technologies to meet those needs.

#### Summary of Survey of User Needs for Telecommunications

An important component of the study was a survey of the health care industry, including telehealth providers and consumers, to establish user perceptions of the need for telehealth services.

Defining needs presented a certain amount of difficulty to most of the interviewees, particularly in the area of market definition and quantification. Applications were identified but very few were able to supply good estimates of costs, benefits, or potential volumes.

During the interviews, a recurring concern of prospective users of telehealth applications was the relative costs of telehealth systems compared with conventional approaches and; more importantly, the question of how these new services were going to be funded.

In order of importance and frequency of identification, the following were the applications and needs identified by the user community:

1. Education - Professional

Continuing medical education was consistently named as the major focal point for a telecommunication application. This would include formal lectures as well as grand teaching rounds and other practical sessions. The need for continuing professional education for physicians, nurses, and all health professionals is a result of the rapid growth and dissemination of new concepts in health care practice (investigation and treatment) and the constraints and cutbacks imposed in recent years on continuing professional education budgets within hospitals and health care institutions.

2. Health Care Delivery

The requirement for remote consultation and diagnostic facilities was high on the list of priority projects. Other health care areas such as centralized poison control and drug information data bases were of equal importance. In the field of health care delivery there is ample evidence of regional disparities in the availability of specialized health care providers (e.g. psychiatrists, geneticists, speech therapists, etc.) and high technology investigative tools. This disparity will always exist and hence there will be a continuing need for telecommunications to support the delivery of diagnostic and consultation services in underserved areas and to provide administrative support for flows of patients and patient information.

3. Administration

Many organizations and associations felt that committee meetings and conferences could be replaced by a form of teleconferencing, limiting travel to a regional centre. The administrative needs of national and provincial organizations and associations (hospital, medical, nursing, dental) also include the collection and dissemination of information to constituents and, more recently, the maintenance of central reference databases.

4. Education - Public

Education of the general public in relation to health care, fitness and nutrition, etc. was presented as a viable



telecommunications market, frequently in conjunction with a professional program. This could be presented, for example, via a "Health Network" (public and private). With generally increased public awareness of the importance of lifestyle in health maintenance and disease prevention, there has been a corresponding growth in the market for consumer health education.

5. Other

Some social aspects were identified such as the need for patients from remote Northern communities to interact with their families verbally and visually.

Summary of Findings from Data Collection

Based on our literature review, personal interviews, and telephone survey of user needs, we have reached a number of conclusions which are important for the future formulation of system concepts:

1. The field of telehealth is not a single homogeneous discipline; it is, in fact, made up of many different applications and user groups. Therefore, no one single technology or small group of technologies will meet all needs.
2. There is intense activity in the field of telehealth in Canada and the United States. In our survey, we found intense and broad interest in the field of telehealth both by potential service suppliers and recipients.

3. The applications tended to focus into one or other families of telecommunication technologies whether teleconferencing, cable systems, slow scan TV, broadband (land and satellite), or data networks. More recently, users are successfully uniting technologies.
4. Users were generally cautiously optimistic about the future of telehealth. Most experienced suppliers were pessimistic about the cost-effectiveness of telehealth systems unless costs decline appreciably.
5. In contrast to other technologies, such as computers, where there is the potential for capital substitution of labour, in telehealth most of the costs are additional, and most of the benefits are intangible in fulfilling unmet needs for education, health care, delivery, administration, and social relations.
6. A national picture of telehealth users emerges which indicates a general lack of coordination between users in different technologies or different regions of the country.
7. Most technologies needed for the support of telehealth are in place and are generally improving in price and performance with time.
8. Telehealth is a constant dynamic involving new technologies, new applications and a shifting regulatory environment.

#### System Concepts

The data collection process produced a tremendous amount of information about the health care system in Canada, the previous,

current and planned telecommunication applications in health use, and the many technologies which are now available to meet these needs. This information was then analyzed and synthesized to identify four major system concepts which have the greatest potential and merit further more detailed analysis. These include:

1. Data Networks
2. Regional Networks for Health Care Delivery
3. Audio Teleconferencing
4. Cable TV Networks for Public and Professional Health Care Education

#### Data Networks

If one looks at the network structure of health care systems in Canada (summarized in Appendix A) it is clear that such a data network offers tremendous potential for Canada. A useful construct would include a data terminal in the emergency department and hospital library of every hospital in Canada. The terminal device itself could be either a standard ASCII terminal, a teletype device, or a personal computer equipped with a telecommunications interface. A Telidon terminal could also be employed if the databases adhered to the Telidon protocol. The true value of such a network lies in the universal availability of information on a "need to know" basis - various classes of users could select databases to access current information to meet their particular needs.

The providers of database material would logically be the national and provincial professional associations (hospital, medical, nursing, dental, etc.). Content of databases include information on:

- drugs
- poison
- therapeutics
- labour arbitration
- salary and wage settlements
- literature abstracts and citations
- medical devices alert
- disease alert
- occupational health and safety

Natural applications for the messaging, bulletin board and scripting services include:

- Professional education notices
- Self evaluation programs
- Ordering of materials
- Disease Surveillance
- Adverse Drug Reporting

In Canada the medium to use would be packet switched networks which provide the widest access at lowest cost. These are available through CNCP (Infoswitch network) and Bell Canada (Datapac).

The corresponding electronic messaging services are Infocall and Envoy 100. In addition, Bell Canada has recently announced iNet 2000 which provides a simple and convenient access mechanism for an individual user to various databases and electronic messaging services.

#### Regional Networks for Health Care Delivery

As a means of delivering health care services including consultation and diagnostic support between rural and urban areas, as well as continuing professional education, a variety of regional telecommunications networks have been tried and developed (particularly through the Hermes and Anik B experiments and through the Ministry of Health in Ontario.

The particular system concept that appears to offer the most promise is exemplified by the approach taken by the Telehealth Program in Ontario. It is based on a network model of health care delivery where particular links in the network can evolve and change to reflect changing technology or usage patterns (clinical care or education) and the technology is selected relative to identified needs. The system will incorporate a "hub" composed of broadband linkages between hospitals in a regional centre using either land-lines or microwave systems. The hub would then be connected through the Ministry of Government Services broadband link satellite or microwave to other parts of the network. Outlying rural hospitals would be connected to the hub through land-line for two-way audio and slow-scan video. A further concept is that of shared management with each health care facility within the network an active participant in establishing policies, procedures, and priorities. This is a departure from the usual model of a "champion" developing an interest in a particular technology and promoting it. Although the network approach is slower to develop because of the need to educate potential users on the capabilities and uses of telehealth and the need to develop consensus it has the greatest chance for long term success.

In regional health care delivery networks the applications will span the full spectrum of diagnostic, consultative and continuing professional education activities identified earlier. The service user will determine content and usage patterns and the regional referral centres will provide the first line of support. Support from major referral centres will only be sought on



an as needed basis. This network approach to providing telehealth services will build upon and strengthen existing patterns of referral.

#### Audio Teleconferencing

A third major system concept relates to the development of audio teleconferences with or without video support. The key features of these systems are the linking of rural hospitals with one or more regional centres to provide short sessions (1-2 hours) on special topics. Individual bridging devices usually have a capacity of 10 to 20 ports which can be used in any combination to support simultaneous independent conferences. The systems have been used mainly for continuing professional education and administrative purposes such as monthly association or committee meetings of physicians, specialists, nurses, physiotherapists and medical technologists. The format usually conforms to an educational round with case presentation followed by discussion.

The major benefits of audio teleconferencing are the reduction in travel costs associated with conducting regional or national meetings, the strengthening of regional and provincial consultation and education programs, the convenience of holding regular regional rounds or meetings, and the educational opportunities provided to all health professionals in their own communities.

#### Cable Networks

A fourth system concept which has potential is the use of Cable TV for the provision of consumer health education and professional health education. The need for continuing professional education has been referred to earlier. The need for consumer health

education is equally important and is an outgrowth of a growing awareness on the part of consumers and health care professionals alike on the importance of preventive medicine. Health promotion and health education have since had a significant impact on disease prevention through programs for:

- seat belt promotion
- smoking cessation
- drug and alcohol addiction
- obesity control
- malnutrition prevention
- exercise and fitness promotion
- careless driving control

The market for cable services are the general consumer markets supported by cable and selected target markets such as hospitalized patients or remote communities with cable services.

The major benefits, which are as yet poorly quantified, relate to the improvements to the health of Canadians through widely accessible health promotion programs. Governments at both the Federal and Provincial level are emphasizing the importance of self-responsibility and self-care behaviours in improving lifestyle and reducing morbidity and mortality.

#### Costs and Benefits

In attempting to estimate costs and benefits for the identified systems concepts, it rapidly became apparent that this was not a feasible task without a detailed market study of each system. Two main reasons contribute to the difficulty: the absence of reliable cost and price information and the large number of assumptions, particularly usage patterns and market penetration that

influence total system cost. Rather than build cost models based on rather vague assumptions, we prepared a table to identify the key cost and benefit components and a representative range of values.

From our review of the literature and our interviews, it became apparent that funding is a key consideration. To date, most telehealth applications have been supported by research, demonstration or government grants with considerable free services provided by major participants, the DOC, H&W, teaching and other hospitals and health professionals. Furthermore, none of the systems concepts has yet proven to be an economically viable concept. In the literature we could not find any telehealth services with a clear and substantial payback to the consumers or end users. The benefits from these services rest mainly with intangibles such as improved support, or improved patient care. The question of cost benefit then becomes whether or not the consumers (physicians, etc.) or funders (governments, advertisers) of telehealth services feel the intangibles related to patient care or education more than offset the costs. Therefore, in order for telehealth to gain wide acceptance, these services will likely need substantial and sustained outside funding, either from governments or from advertisers/promoters.

From our review of the various costs and benefits, we believe the system concepts with the greatest chance of commercial success are:

- a national data network involving hospitals, physicians, nurses and other groups of health professionals which would utilize existing and planned American and Canadian (Telidon)

databases for a combination of continuing professional education, health care delivery, and administrative functions. These systems are also reasonably cost-beneficial, simple to use, and based on the universally available telephone system. They are already in limited use in the health industry and industry at large, and usage is expected to grow as potential users become familiar with these systems.

- secondly, an audio teleconferencing network, with or without video augmentation, which can support needs for continuing professional education, administrative functions, and remote consultation using slow-scan video. The costs for data network access and usage are relatively low and continually declining and the needs of the health care industry for selective access to information (on a need to know basis) continue to increase.

#### Regulatory and Other Barriers to Telehealth

The regulatory and other barriers which were identified for telehealth applications were quite different for each of the four system concepts we identified. The major issues are summarized opposite.

#### Data Networks

Data networks represent the convergence of telecommunications, computer, and cable television technologies and it is, as yet, not clear which direction the current information revolution is going to take. The major regulatory dispute centres on

who will provide "value-added" or "enhanced" services. The CRTC is expected to hold hearings on enhanced services in the next year.

Other non-regulatory issues include the question of who will provide the databases and whether Canadians should even develop their own databases or simply tap into those already developed for the American market.

If Canadian databases are to be developed, the relatively small size of the Canadian market dictates the need for fewer better funded databases rather than the proliferation of independent databases we found in our survey.

#### Regional Networks

Major barriers to the introduction of regional networks relate to need to have these networks developed in response to user demand rather than supplier push. Regional networks also have the potential for altering roles of health care providers and disturbing conventional referral patterns.

Another issue which arises was the confidentiality of satellite transmissions particularly if they include psychiatric consultations. We believe that current scramblers are available to ensure confidentiality.

A final issue relates to adjusting the reimbursement of physicians to recognize the time involved in providing remote consultation services.

Medico-legal liability was also considered a potential barrier; however, no precedents have yet occurred in Canada which would clarify the law in this regard.



#### Audio Teleconferencing

The major barrier to the broader use of audio teleconferencing was the fact that, in some of the systems identified, the agenda for the teleconference was set centrally rather than in response to user defined needs. This has become less of a problem as each of the networks develops experience.

Various users also identified the need for special skills in concluding and chairing teleconferences. Again we believe these problems are minor and will be resolved as users gain experience with the new technology.

#### Cable Television

The regulatory framework for the provision of specialty satellite programs are in a state of change in response to the government's request for proposals for the provision for specialty programming services on a discretionary user pay basis. The chief barriers as discussed under this system concept relate to the inability at present for these services to generate sufficient revenues without advertising revenues and some form of subscriber revenues collected by the cable distributors on a non-discretionary basis or through the provision of a tiered service. This issue will soon be re-examined by the CRTC.

#### Recommendations

In reviewing the proposed systems concepts, a number of areas were identified where action could be taken to promote the effective use of telecommunications in the health care industry in Canada. These activities should ideally be a shared responsibility of

governments (federal and provincial) and professional organizations (national and provincial) and focus on the three key requirements for improved communication, education, and funding.

#### Co-ordination of Activities

If the volume of telehealth activity is to grow in Canada, a much greater degree of co-ordination at a national, provincial and regional level will be required. There is a need for national task forces, including membership from the national professional bodies such as the Canadian Hospital Association, the Canadian Medical Association, the Canadian Nurses Association and others. The task forces should act as important agents for collecting and disseminating information, setting standards, assessing the requirements of their constituents and assigning priorities for future developments.

#### Creation of National Databases

From our review of existing uses, we found a large number of independent centres developing their own information services. We believe the interests of Canadians could best be served by developing single reliable reference databases for drug, poison, nutrition and other information. There are a number of other opportunities where a national database would be of significant benefit.

#### National Standards for Telehealth

A third area where we believe action is required is in the standardization of technology employed in the delivery of telehealth services. The standardization required in each of the

system concepts is somewhat different and would need to be addressed separately by the national task forces.

#### Dissemination of Technology Information

Repeatedly in our interviews, we found that there is a need to make health care providers much more informed about what is available. A number of the national organizations such as the Canadian Hospital Association and the Canadian Medical Association are maintaining watching briefs on telehealth developments. The Telehealth Team of Health and Welfare Canada is another vehicle in collecting and providing information concerning telehealth.

Finally, there is a need for a simple handbook for prospective users of telehealth to appreciate the technology, learn how to assess their needs and evaluate options available to them. Examples of handbooks for audio teleconferencing were found, but these need to be broadened to include the other systems concepts identified.

A somewhat different publication would be a telehealth handbook which summarizes, for each type of application, the history, the current status of technology, and current application developments across Canada with a regular (monthly or quarterly) update program analagous to the Canadian Telecom Alert published by the Canadian Industrial Communications Assembly. Such a handbook would be a very useful source of reference information for practitioners in the field. The Department of Health and Welfare and Communication could sponsor the development of such a handbook.

#### Funding

The overriding consideration of most of the people interviewed was the need for ongoing subsidies to the telehealth

market. At the federal government level, opportunities for seed funding for developmental efforts are available.

Until recently, the professionals involved in telehealth experiments have contributed substantial amounts of their own time without reimbursement to these projects. If they are to be successful on an ongoing basis, changes to the provincial health insurance plan to recognize the services provided by remote consultation will be required. In Ontario, the Ontario Medical Association and the Ministry of Health have established a joint committee to review physician reimbursement. Similar committees will be required across Canada.

A third potential source of funding for telehealth applications will be from the private sector by way of advertising and other revenues. Consideration needs to be given to the provision of advertising services on specialty cable television channels or alternative revenue sources.

#### Regulatory Review

There are three areas where regulatory review is appropriate. In the first instance, long distance rates were felt to be prohibitive for health care facilities in remote and rural areas. Telecommunications is a sine qua non of health care in rural and northern Canada and it is imperative that accessible, reliable and affordable telephone services be provided to these health care providers either through land-line or satellite services.

The second area where regulatory review is required is in the area of broadband channel costs. Currently, a prospective user must buy a dedicated channel on a scheduled basis. The experience with telehealth demonstrates that users require random and sporadic access to telehealth equipment. It would be much more cost effective to have broadband costs related to actual usage of the channel and the amount of band width required rather than absorbing the full cost of a dedicated channel. Various sharing arrangements are currently being considered.

The third area for regulatory review is the provision of value added services by companies. This clearly has important ramifications for the full telecommunications industry; however, it is important that the needs of the health care industry be represented in these discussions.

As telehealth evolves in Canada, new approaches are continually being developed to apply telecommunications technology to meet the diverse needs of the health care system. In addition, health care providers are becoming increasingly aware of the potential of telecommunications to support and enhance the health care industry.

As the technological problems are resolved and each of the remaining barriers of inadequate education, funding, coordination and regulations are met and crossed, telehealth will have a significant impact on the future delivery of health education, health care services, and administration of the health care system.



## EXHIBIT 1

### Definition of Telemedicine

- "use of two way or interactive television to conduct transactions in the field of health care" Park (1974).
- "the practice of medicine without the usual physician - patient physical confrontation, via an interactive audio - video communications system" Reid (1977).
- "the situations in which health care professionals use telecommunication channels to communicate with each other or with their patients with the good of improving in some way the delivery of health care services" Shinn (1975).
- "any system of medical care in which the doctor and his patient are at different locations". Willemair and March (1971)
- "telemedicine is the use of telecommunications technology to assist in the delivery of health care including consultations conducted over the telephone as well as the more sensory-rich modes" Dunn (1983).

## 1. INTRODUCTION

### 1.1 Definition of Terms

As the exhibit opposite indicates, individual authors have used the term telemedicine in a variety of ways. The prefix "tele" means "at a distance" and hence telemedicine means medicine at a distance. Similarly, telehealth means health at a distance. For purposes of this study, we have taken a very broad view of telehealth to encompass the application of any telecommunication medium in the support of a range of health care activities including medicine, dentistry, nursing and allied health professionals.

The media that we considered included terrestrial systems such as telephone, cable, data networks, audio teleconferencing and extra-terrestrial systems encompassing satellite communications technology.

In order to organize our thinking on the very wide range of applications encountered, we grouped them under four major headings:

1. Health education (including general consumer education, and continuing professional education);
2. Health care delivery (including support for remote consultation, or diagnosis, and information services which support the health care delivery process such as poison control or drug information);
3. Administration (including the needs of agencies, hospitals, provincial and national professional organizations and governments at all levels);
4. Social (including the social contact needs of both residents/patients and health care professionals).

A more detailed description of telehealth applications will be provided in a later section (Section 4.3).

## 1.2 Background

Telecommunications technology has undergone a period of very rapid development during the past decade and this trend is expected to continue into the future. This evolving technology has opened the way for a diverse array of new telemedicine applications. With the unique Canadian problems of climate and geography, it is understandable that Canada took an early interest in developing new satellite based telecommunications technology. With the launch of the Anik A-1 satellite in 1972 by Telesat Canada, Canada became the first country to develop a domestic telecommunications system utilizing satellites in geostationary orbits. Canada later participated with the United States in the development and launch of the Communications Technology Satellite - Hermes. When it was launched in 1976, Hermes was the world's most powerful communications satellite. As part of the Hermes program (and later the Anik B program) the Canadian government supported a number of experiments in the telehealth, tele-education, and other practical telecommunication applications. Through these projects and follow-on studies, the Departments of Communication and Health and Welfare Canada participated in and stimulated a variety of telehealth satellite experiments.

In parallel with these developments in satellite communications were advances in terrestrial communications. Health

care providers were quick to experiment with evolving technologies to provide improved patient care and continuing professional education to remote communities. Some of these experiments included the following trials:

- o Interactive Television between the University of Western Ontario's medical centre and health care centres at Moose Factory in Northern Ontario.
- o Dedicated Telephone Networks with a teleconferencing bridge between the Memorial University Medical Centre in St. John's and twenty other hospitals and health care centres in Newfoundland.
- o Non-Satellite Systems between the University of Toronto's Sunnybrook Medical Centre and nursing stations north of Sioux Lookout. This project uses a telephone system complemented by slow scan transmission of X-rays, electrocardiograms and other medical data in video form.
- o Interactive Telephone/Television link between Sacre-Coeur Hospital and Hotel Dieu in Montreal and a temporary hospital at James Bay.
- o Darome Bridge technology for an experimental program of continuing health education run by the Toronto General Hospital and the Royal College of Physicians and Surgeons of Canada.
- o Microwave Links between University Hospital in London, Ontario and Woodstock General Hospital for interactive transmission of radiological, educational, clinical and consultative data, including psychiatric examinations.

Another major innovation currently being designed and tested is the Tele-Health (Tele-Sante) medical information network based on the Telidon system. This network is designed to reach both doctors and patients. Cable television will provide access for the public, while Tele-Health's own mainframe computer equipment will offer direct data communication to medical offices, clinics, drug stores and other health care centres. Field trials of this network in the Bell Vista Telidon trial in Quebec have generated very encouraging

levels of usage and interest, outperforming all but one of 24 other specialized information services in the trial.

As a result of these developments and parallel work in the U.S. (for example, the Cable Health Network) and abroad, considerable potential is seen for telemedicine applications. A Telehealth program has been established within the Health Services Branch of National Health and Welfare to monitor and advise on the use of communications in the health care system.

### 1.3 Study Objectives

At present, the telemedicine projects outlined above and others are still largely in the trial stages in a limited number of facilities. The Department of Communications (DOC) wishes to explore methods of extending the benefits of modern communications for the delivery of health care on a much wider scale, including both prevention and care.

### 1.4 Study Scope

In May 1983, we were retained by the Department of Communications to undertake a review of current uses of telecommunication in health care.

The objectives of the review were as follows:

- to provide the Department of Communications with a summary of the health care system in Canada;
- to provide a survey of current uses of telecommunications in health care in Canada and other countries;
- to indicate future system concepts which might be developed in Canada;
- to identify suitable high priority areas for further investigation; and
- to prepare a report outlining our findings and recommendations.



There are over 1,500 health care institutions in Canada in addition to thousands of individual medical and health care practitioners. This study provided a broad examination of the health care system in Canada and its merging communications and information requirements.

It included a broad survey of the perceived telehealth needs of potential user groups such as governments, professional associations and health care providers. The study further identified application areas where significant potential exists for future growth and development and where further more detailed investigation is warranted. This study thus gives a snapshot in time of the very rapidly changing telehealth developments in diverse applications across Canada.

Finally, the study included the preparation of a report summarizing our findings and recommendations. This report is intended for the staff at Department of Communications and other providers and carriers in the public and private sector who are (or wish to become) active in the provision of telehealth services.

## 2. APPROACH AND STUDY METHODOLOGY

### 2.1 Approach

In order to carry out the broad-ranging study required here and to determine the requirements for telecommunications in the health care system, within the constraints of a limited budget, we used a multi-disciplinary team approach utilizing specialist staff from our Health Care, Telecommunications and Market Research practices. Where appropriate, we sought the advice of outside experts including specialists in telecommunications applications in health care, a physician in the Department of Family and Community Medicine at the University of Toronto with previous telehealth experience, and a lawyer whose practice is principally related to the legal and regulatory issues pertaining to telecommunications.

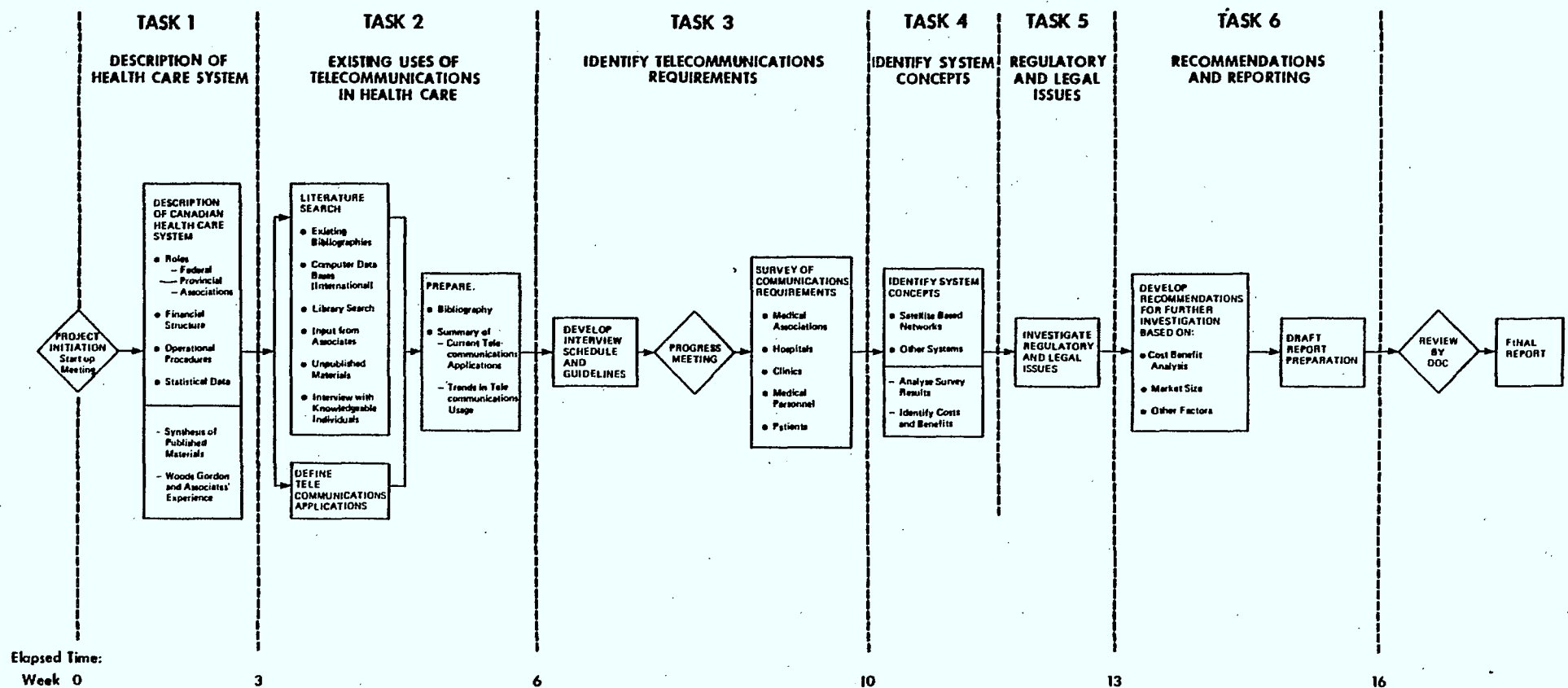
Our approach took a broad view of the communications and information needs of the full health care system including:

- o Hospitals, clinics and other institutions such as nursing homes
- o Medical practitioners, both within institutions and those practising independently
- o Suppliers of services to the health care system such as pharmaceutical companies and trade associations
- o Provincial and federal government personnel and departments involved in regulating and monitoring the health care system.

During the study, a large number of system concepts could have been developed. Our approach was to identify those areas where the systems would likely have the most widespread applications, or the largest benefits in terms of both the prevention and care elements of the health system. Based on the results of the data

# TELECOMMUNICATIONS IN THE HEALTH CARE SYSTEM

## STUDY FLOWCHART



collection, interview program and analysis proposed in the study methodology section of this proposal, we identified user needs and from these, determined the most promising system concepts and evaluated the cost effectiveness of these. Less promising opportunities were identified in our report and documented for possible later evaluation.

These concepts were then reviewed in terms of their costs and benefits. Because of the large number of assumptions that go into developing these system concepts, we could only develop very general estimates of costs and benefits.

Once these system concepts were developed, we reviewed some of the barriers both institutional and regulatory to the general introduction and implementation of these concepts.

From this analysis, we then developed recommendations pertaining to the need for coordination, education and funding to evaluate the spread and diffusion of telehealth applications across Canada.

## 2.2 Study Methodology

To produce the outputs defined by the Tasks outlined in the terms of reference, our work program followed the study flowchart presented opposite.

### Start-Up Meeting

A start-up meeting was held with the Scientific Authority for this study to review the proposed study methodology, work program and approach to identifying potential communications systems. This provided an opportunity to fine tune the proposed approach and work plan and establish reporting relationships.

Task 1: Description of the Health Care System in Canada

In Canada, provincial governments have primary jurisdiction over health services, with the federal government having responsibility for specific areas of service (e.g., quarantine, marine hospitals, quality of food and drugs, and health services for special populations). Some degree of program conformity across Canada has been achieved through federal legislation under which the federal government shares its tax revenue with those provinces willing to establish health programs meeting certain standards. New federal legislation being proposed (The Canada Health Act) would further specify these standards and associated penalties for provincial failure to meet them.

Nevertheless, the historical provincial responsibility for health care has produced ten distinct though related health care systems in Canada - systems which all are continually being adapted and enhanced to better meet the needs of the respective populations.

Describing such a complex Canadian system is a major undertaking. Fortunately, it is an endeavour that has been successfully completed by several authors in the past, from a variety of viewpoints. The approach we took for Task #1 was to take advantage of the excellent documentation of the health care system that is already available from a wide variety of sources available to us, and then to organize this general information into a focussed description of the system from a communications requirements perspective.

This approach consisted of three component activities:

- o Identification and review of the most recent and comprehensive documents describing the Canadian health care system;
- o Updating of the material in these documents to include the latest available statistical information (e.g., number and distribution of medical facilities and personnel) and new major legislative/program changes (e.g., the proposed Canada Health Act and the new Emergency Health Services plans in Ontario); and
- o Production of a description of the Canadian health care system which is relevant to the identification and quantification of telecommunications requirements.

A summary of the above description became the first section of our study report, and relevant statistical information (e.g., number and distribution of health care facilities and medical practitioners) are attached as appendices.

#### Task 2: Existing Uses of Telecommunications in Health Care

To determine the existing uses of telecommunications in the health care system, we carried out a comprehensive literature search program on the subject of telehealth/telemedicine. This research included:

- o Expert input from our study advisors;
- o Existing bibliographies such as the 'Telehealth-Telemedicine Bibliography' produced by Judy Roberts of Memorial University and Jocelyne Picot from the Department of Communications at Simon Fraser University in British Columbia, as well as a telehealth literature review prepared by Dr. Earl Dunn;
- o Computer data base access to obtain literature relating to telecommunications applications in health care;
- o Library Research in our own library and other specialist communications and health care libraries such as the College of Family Physicians of Canada library;
- o Interviews with other knowledgeable individuals in this field.



The results of this literature search and review was a comprehensive data base on developments in telehealth/telemedicine. This data base is summarized in the form of a bibliography included as an appendix to this study report.

Based on the applications knowledge of our Telecommunications Group staff and input from our literature search, we developed a description of current telecommunications usage for health care delivery in Canada and abroad. This focussed on two areas - applications already in widespread use and, most important, those applications in the trial stages or in limited use at present, and where there are opportunities for expanded usage.

A further output developed from this literature search was a summary of trends in communications usage in health care which were used to identify system concepts, and provided a preliminary indication of some of the areas in which needs exist.

### Task 3: Survey of Telecommunications Requirements

To supplement the insights on telecommunications needs and requirements obtained from the literature search phase of the project, we undertook a survey of the communications requirements of medical associations and institutions, nursing stations/clinics and medical personnel.

Due to the high degree of flexibility required in carrying out a survey of this type, aimed at identifying potential telecommunications needs that could be met by new technology, we used an interview program comprising personal and telephone interviews with knowledgeable health care system personnel across Canada. The interview program covered key personnel in the following sectors.

- o provincial medical associations
- o hospital administrators
- o medical personnel
- o federal and provincial government staff

The requirements of patients were covered through discussions with the above sectors. It was not considered appropriate to interview patients directly since an adequate sample would be well beyond the budget of this study. In addition, patients were not considered to be knowledgeable about the availability of potential alternative or improved communications services and would need to be educated. This in turn would considerably reduce the degree of confidence that could be placed in the responses.

We conducted a total of around 90 interviews to provide the necessary data to supplement the literature search. The interview program concentrated on selected knowledgeable and experienced individuals across the country in each of the sectors identified above, as the means of ensuring the highest level of efficiency in collecting data. This was not a 'random' survey which can be treated statistically and 'grossed-up' to the total population size.

By concentrating on appropriate knowledgeable individuals, we were able to apply the results of these interviews across the total health care system to provide estimates of potential total requirements.

In addition, we held personal interviews with representatives of the Canadian Medical Association, the Canadian Hospital Association, and Health and Welfare Canada.

We conducted a number of site visits with Bell Canada and Infomart to review recent technological developments in data base storage and data networking.

#### Task 4: Identification of System Concepts

From the various data sources identified above, we developed a comprehensive summary of telecommunication applications in health care in terms of senders, receivers, and message types. This summary was then condensed to identify for each category of telehealth applications (health education, health care delivery, administration, and social) a list of potential markets for these service groupings. Each combination of telehealth applications and markets was then examined to identify potential telecommunication media for transmission of the message.

From this review, four system concepts were developed for more detailed analysis. A system concept was taken to mean a combination of message providers, message receivers, telecommunication media, and funding source which taken together might effectively deliver telehealth services.

These system concepts included both satellite based networks and other possible delivery technologies such as Telidon, cable television, local area networking, wide area networking, etc. The system concepts developed took account of the differing costs of providing various levels of service. Each system was evaluated on a cost benefit basis utilizing potential benefits data developed from the survey program. Benefits were measured in dollar terms where possible, as well as in terms of time saved, convenience, improved level of care, and other benefits that cannot reasonably be measured in dollar terms. It was obviously impossible in a broad ranging study

of this kind to devote sufficient resources to provide detailed measures of costs and benefits; however, order of magnitude estimates were prepared consistent with the data collected in the study.

The system concepts developed were defined in terms of a system description including such elements as:

- o Description of the communications and/or information needs to be met
- o Definition of the technical system and equipment necessary to meet these needs
- o Specification of system size and number of users, terminals, or other elements required
- o Estimate of system costs
  - hardware
  - software
  - operating cost
- o Definition of approximate expected system benefits (and, where possible, quantification of these in dollar or other appropriate terms)
- o Definition of potential market size.

#### Task 5: Regulatory and Legal Issues

The institutional, regulatory, and legal issues preventing the widespread introduction of telehealth applications were reviewed and summarized. Further legal and regulatory advice was provided by a partner from the law firm of McCarthy and McCarthy who practices in the telecommunications area.

Task 6: Recommendations and Reporting

The study results were synthesized into a report covering the results of each Task and recommendations regarding effective possible uses of telecommunications and areas where further investigation, planning, system trials, or other developments are required to enhance the delivery of health care services through application of telecommunications technology.

We then prepared this report outlining our findings and recommendations.

Throughout this study, we had frequent reviews and discussions with representatives of the Department of Communications, the Department of Health and Welfare, the Canadian Medical Association and the Canadian Hospital Association. We wish to thank them for their assistance and constructive criticism throughout this study.

### 3. CURRENT APPLICATIONS AND USER NEEDS

#### 3.1 Description of the Health Care System in Canada

A review of the health care system in Canada was undertaken with a view to providing the uninitiated with some appreciation of the history and scope of the system. It also provides a basis for estimating the need for telehealth services and developing scale factors that enable one to extrapolate from particular province or particular health disciplines to the system as a whole. The full review is included as Appendix A for the reader who wishes a more in-depth analysis. For the purposes of this study, a few salient features stood out and are summarized below:

- the health care system is regulated by a patchwork of federal and provincial legislation which provides for federal cost sharing subject to certain minimum standards including: portability across provinces, reasonable access, universal coverage, comprehensive coverage, reasonable compensation of providers, uniform terms and conditions, public administration on a non-profit basis. The commitment to reasonable access provides an impetus to use telecommunications to provide health services to northern and remote communities which cannot be supported through existing means.
- the federal contribution to overall health care costs is approximately 50%. Health and Welfare Canada contributions through cash payments and tax transfer will be 9.4 billion dollars in 1983/84. These statistics would indicate that the health care industry in Canada is substantial and would provide an important market for telecommunication services.
- under the British North American Act, the provincial governments have primary jurisdiction over almost all health services. Therefore, the responsibility for the regulation of health care, the operation of health insurance plans, and the direct provision of most health services rests with the provincial governments. The federal government has responsibility only for very specific areas of service of national concern: health service for natives, penitentiary inmates, armed forces personnel and veterans\*. Because of this, most telehealth

\*Services for veterans may be provided through provinces but paid for by Federal Government.



projects will need to be initiated and supported at a provincial level except in those areas, listed above, where the federal government has principal responsibility.

- many of the provinces have a regional office structure under their health department - for example, the Ministry of Health of Ontario has established District Health Councils to encourage regional planning for health services. Because of this regional orientation telehealth programs for the support of health care delivery need to be developed in close cooperation with these regional bodies (where they exist) and telehealth programs should take into account these regional networks.
- the health care system is dominated by the institutional care component (including hospitals, rehabilitation treatment centres, mental retardation facilities, etc.) which utilize the lion's share (approximately 53%) of health care expenditures. Hospitals tend to be the single largest and most influential health care provider in any community. It is understandable then why many of the existing telehealth projects involve the linkage between hospitals in urban and rural centres.
- the most influential health care providers are the physicians who are the "gatekeepers" to the system and the nurses who are the major care givers. There are approximately 42,000 physicians and 200,000 nurses in Canada. Programs for professional education will therefore tend to be directed initially to physicians and nurses.
- approximately 56% of the population of Canada is in metropolitan areas and these are mainly confined to areas adjoining our southern border with the United States. Therefore, the principal markets for public health education and continuing professional education are also located in these centres.
- there are marked variations in the utilization of health care resources between provinces and between southern urban areas and northern rural areas. This is thought to be mainly due to differences in the supply of health care providers. This disparity is expected to continue in the future despite various government incentive programs. Telehealth programs therefore provide an important alternate means of satisfying some of the current and future health care needs of people in rural Canada.
- the relatively low population density of northern and remote areas of Canada cannot possibly justify the same level of specialist support and specialized high technology diagnostic equipment that is available in the major urban teaching centres. Therefore, there will always be a need to develop

telecommunications techniques to make these services available to those who require them.

- the proposed Canada Health Act is not expected to impact on telehealth developments except insofar as it limits the sources of funds available to provincial governments to introduce new services.

### 3.2 Current Uses of Telecommunications in Health Care

Despite many examples of early telehealth applications dating to the early 1930's, the field of telehealth as we now know it has developed significantly only in the last decade. As such, the literature is filled with experiments or trials, but few of these early applications have become commercially viable systems in operation.

We will briefly outline previous Canadian and United States telehealth programs and key trends expected in the future. A summary review of the American and Canadian experience is provided in Appendix B.

#### Canadian Experience

In Canada, the development of telehealth programs has developed in three stages:

1. The first stage was characterized by early experimentation by "champions" who recognized the value of telecommunications technology in support of health care delivery needs.
2. The second stage was prompted by infusions of federal and provincial funds for experiments and clinical trials.
3. The third phase has witnessed the privatization and proliferation of telehealth programs from the early sentinel telehealth projects to a larger national market.

Some of the early sentinel projects in Canada were listed in section 1.2 of this report and include:

- a dedicated telephone network in Newfoundland for continuing education and the provision of health care services to remote communities
- telephone links for the transmission of slow-scan images between Sunnybrook Medical Centre and Sioux Lookout to support consultation services to remote communities

These early experiments were initiated by clinicians who saw the potential of telecommunications to meet needs of the health care system.

The second stage was stimulated in large measure by federal initiatives both through its satellite program and, later, through its Telidon program.

Canada has always played an active role in the development and use of satellite technology. With the launch of Alouette I in 1962, Canada became the third nation with space satellites. With the successful launch of Anik A-1 in 1972 (by Telesat Canada), Anik A-2 in 1973, and Anik A-3 in 1975, Canada established a network of telecommunication services to the north utilizing "geostationary" satellites. The term "geostationary" refers to the fact that as the earth rotates the satellite maintains the same position relative to the earth's surface at a distance of approximately 23,000 miles above the equator. Because of the stationary position of the satellite in orbit, the earth station antennas for transmission and reception can maintain a relatively fixed orientation, as compared to the much more complex and expensive tracking stations required for non-geostationary satellite applications. The early satellites operated in the lower frequency

bands of 6/4 GHz corresponding to the same bands used by the terrestrial microwave systems.

Canada later participated with the United States to develop satellites that operated in a somewhat higher frequency range corresponding to the 14/12 GHz band. The higher frequency provided exclusive usage by satellites and hence, no interference from existing users as with the more crowded 6/4 GHz band. The higher power employed in this satellite also permitted the reception of the higher frequency (i.e. shorter wave length) signals with smaller antennae. When it was launched in 1976, the Communications Technology Satellite - Hermes, was the world's most powerful communications satellite. It operated successfully for 4 years - almost twice its designed lifespan. As part of the Hermes program (and later the Anik B program), the Canadian government supported a number of experiments in the fields of telehealth, tele-education, and other telecommunications applications. These three experiments and their implications are summarized below:

- A five month trial employing an audio link between a remote nursing station in Kashechewan, Ontario and a hospital in Moose Factory, combined with an audio and two-way video link between this hospital and University Hospital in London.
- A three month trial utilizing one-way video and two-way audio between the Health Sciences Centre of Memorial University in Newfoundland and four peripheral hospitals for the provision of continuing medical education. In a later Anik B experiment, the satellite was used to link several remote communities in Labrador.
- The production and broadcast of native health information programs to residents of northern Alberta through project Ironstar.

From these early Hermes experiments, a few tentative conclusions were reached:

- A dependable reliable and high quality telephone service is fundamental to the health care system.
- The cost of providing broad-band services to northern hospitals and the allied telecommunications equipment used at remote nursing stations was prohibitively expensive.
- /- The continuing education needs of health professionals could be adequately met and at considerably less cost by audio teleconferencing with the pre-circulation of visual aids rather than the use of one-way or two-way video conferencing.
- Finally, most of the telehealth needs could be met using conventional terrestrial telephone links.

An important follow-up to the three initial Hermes telehealth experiments was prompted by the launch of Anik B in 1978. This satellite was used for 19 projects in direct broadcast programming (e.g. TV Ontario to remote homes), community communications to Inuit, tele-education, advanced technology, and telemedicine. The latter included a voice, data and slow-scan video link between St. John's Newfoundland, Goose Bay, Labrador, Labrador City and Makkovik Labrador for consultations, community health education, continuing professional education and teleconferencing. This trial later included the use of earth stations for communication with an off-shore Petro Canada drilling rig. Another Anik B trial was conducted at the University of Montreal in two phases - the first phase consisted of a broadband two-way video link between a hospital at the James Bay hydroelectric development site (LG-2) in northern Quebec and the Hotel-Dieu and Sacre-Coeur hospitals in Montreal, and the second phase involving a more limited narrowband (slow-scan) link between the three centres. Understandably, the users preferred the earlier broadband approach because it was faster and more accurate.

These early Hermes and Anik B have stimulated a variety of follow-on projects including:

- the interactive broadband project at the University of Western Ontario and Woodstock
- the teleconferencing network in Newfoundland and later a similar network based at the Toronto General Hospital
- a counselling program for parents of hearing impaired children using slow-scan TV
- the link between Memorial University and a Mobil drilling rig in the Hibernia oil fields
- the use of Anik B by TV Ontario and the Knowledge Network in British Columbia

All of these projects have been brief and complicated by technical and organizational difficulties. They demonstrated that satellites can be used to provide telehealth services; however, the costs are high and these services can only be cost justified if they support a large user community. In the Canadian context, this means the shared use of these systems with other education and social services applications. A more detailed summary of these experiments is provided in an article by the Coordinator of the CMA's council on medical education in the April, 1983 Canadian Medical Association Journal (included as Appendix C).

In parallel with Canada's space program has been a major involvement by government in the videotex industry through the development of the Telidon standard in 1978 and later, in 1981, through a \$9.5 million Telidon Industry Investment Stimulation Program (IISP) incentive program for providing 6,000 Telidon terminals for use in new Telidon systems operated by the private sector. In 1983 the



EXHIBIT 3  
TELIDON PROJECTS  
IN THE HEALTH INDUSTRY

Project

1. Toronto General Hospital
  - is using Telidon for drug information
2. L'institut de Recherche de Montreal
  - is using Telidon in psychiatric research
3. The Metropolitan Toronto Hospital Council
  - has two pages of information on each hospital entered on the Toronto Telidon Tourist Information Service
4. Toronto Institute of Medical Technology
  - has developed a video-tex computer assisted learning (CAL) application for radiology technology students
5. The Saskatchewan Association of Rehabilitation Centres
  - has a Telidon patient information service underway with four user terminals
6. The Bureau de Coordination
  - is planning to distribute thirteen terminals to the thirteen University of Montreal affiliated hospitals
7. Canadian Hospital Association
  - is developing a health information service using Telidon

Telidon projects being considered

1. Canadian Arthritis and Rheumatism Society

Telidon program was extended for two years and a further \$23 million was allocated to the program. Significant early Telidon trials included:

- Project Grassroots between Manitoba Telephone System (MTS) and Infomart which provided videotex service to the agribusiness
- Project "Visitors Guide" to provide tourist information through 2,000 terminals at a cost of \$11 million provided by the Province of Ontario, Infomart, and the Toronto Star
- Bell Canada "Vista" Telidon trials involving an investment of \$10 million.

Considering the level of interest and investment in Telidon, it is understandable that a number of telehealth applications would also be developed. Some of these are summarized in the exhibit 3 opposite and will be discussed in greater detail in a later section.

In Canada, we are now entering the third stage of telehealth development in which telehealth applications are disseminated from the research and government subsidized environment for widespread use.

Across Canada, we identified a wide variety of ongoing telehealth activities and a sample is included below:

1. An interactive broadband link between the University Hospital, London and Woodstock General Hospital.
2. A ground based teleconferencing system linking all 38 hospitals and a variety of vocational education schools and other health institutions in Newfoundland.
3. A satellite link, using Anik B, between Memorial University and an oil rig in the Hibernia oil fields to support health care, education, and administrative applications.
4. The Knowledge Networks in British Columbia which uses Anik C to provide adult education to the general public.

5. A slow-scan TV link between Sioux Lookout and Sunnybrook Hospital and Hospital for Sick Children for the provision of remote consultation services.
6. A Darome bridge, located at the Toronto General Hospital, used to provide audio teleconferencing facilities provincially and nationally.
7. A large number of Telidon projects underway to develop the database material suitable for a video-text service for the following uses:
  - drug information
  - medical devices alert
  - Telidon in Psychiatric research
  - computer assisted learning
  - patient information service
8. The development of user driven telehealth networks for health care delivery based on current health care delivery patterns. The Northeastern Ontario Telehealth Network has submitted plans for a broadband communications linkage between the 5 member institutions in Sudbury and the Provincial Government studios in Sudbury which, in turn, provides a broadband link to major referral centres in the south. In addition, a slow-scan system will be provided between Sudbury and surrounding facilities.

Similar telehealth planning task forces have been established in Algoma and Thunder Bay.

9. Broadband links such as those which have been established between major hospitals in Montreal, London, Winnipeg, Calgary and Vancouver.
10. The Canadian Health Network and two other companies have filed applications with the CRTC for the provision of a dedicated cable TV channel for health education to the general public and health professionals.

Through our literature review and interviews, we have identified only a sample of the many telehealth activities occurring across Canada.

#### U.S. Experience

As described by Rashid L. Bashshur, the development of the telemedicine in the United States can also be separated into three stages:

1. The first stage, 1964 - 1969, was characterized by experimentation on the part of medical practitioners working independently of each other, on the clinical applications of telecommunications technology.
2. The second stage, 1969 - 1973, was characterized by a trend toward the exchange of knowledge and experience among the participants, and by government support and sponsorship of research and demonstration programs in telemedicine through the Health Care Technology Division in the Department of Health Education and Welfare.
3. The third stage started in 1973 and was characterized by the idea of telemedicine as an innovative mode of medical care delivery. The major challenge was to make telemedicine programs (which had previously been heavily subsidized) economically viable.

A distinguishing feature of the American experience has been their heavy reliance on microwave technology. It is uncertain how many of the systems identified below are still in operation, although it is estimated that most of these were discontinued when the federal funding was withdrawn.

Significant sentinel projects in the United States are briefly summarized below to illustrate the diversity of applications.

- During 1964 - 1967, a closed circuit television link was installed between Nebraska Psychiatric Institute in Omaha and Norfolk State Hospital, 112 miles away, for the provision of education and training programs, remote consultation, remote diagnostics and remote monitoring of patient wards by nurses.
- In 1967, an interactive television link was installed between Massachusetts General Hospital and Logan International Airport in Boston for the provision of emergency care and remote supervision of a nurse-clinician located at the airport.
- In 1969 - 1973, telemedicine systems were implemented in a variety of rural areas to test the cost and effectiveness of remote health care delivery. Pilot sites included:
  1. INTERACT (Interactive Television Networks), based at Dartmouth Medical School at Hanover, New Hampshire;

The INTERACT network provides a microwave linkage for closed circuit television between coronary care units, radiology departments, medical offices, and classrooms for both nurse and physician education;

2. Rural Health Associates in Farmington, Maine;
3. Blue Hill Memorial Hospital in Blue Hill, Maine;
4. Puerto Rico telemedicine program in Ponce, Puerto Rico;
5. Lakeview Clinic in Waconia, Minnesota;
6. Alaska Native Program in Alaska and Seattle, Washington, and
7. The STARPAHC project on the Papago Indian reservation in Southern Arizona utilizing a fully equipped mobile health unit which travels throughout the reservation and maintains audio and visual communication with a central clinic facility.

A number of systems were also implemented in urban areas to provide services to nursing home patients, prison inmates, and for the coordination of administrative functions in large hospitals. These projects included:

- In 1973, a link between nursing homes in Boston and Boston City Hospital
- In 1973, a link between the University of Florida School of Medicine and the Dade County Penal Institution
- A picturephone link between Cook County Hospital Urology Department and Bethany Brethner/Garfield Park Hospital for administrative coordination

Very few hard conclusions were drawn in the literature from these experiments or demonstrations. The general observations made include:

- It was difficult to draw conclusions from short term trials
- Questions about the effectiveness and acceptance of telemedicine as an alternate mode of health care delivery were still unanswered. None of the programs operated at sufficient peak patient loads to warrant a true test of cost effectiveness.
- The systems varied markedly in the proportion of activity devoted to health education, patient care delivery, administration or social needs.

In addition to these observations in the literature, we observed a number of fundamental differences between the American and Canadian health care systems which make it difficult to extrapolate from one setting to the other. The three most obvious difference are the following:

- The free market nature of the health care system in the United States encourages hospitals to provide telehealth services to attract physicians and patients. The cost of these services can often be passed back to third party payers. In the Canadian environment, hospitals do not usually have a direct interest in marketing their services and operate under global budgets.
- The potential market for any telehealth programs are larger and more concentrated in the United States. Many telehealth programs require a mass audience to become economically viable and the relatively small size of the Canadian market makes most programs less economically viable.
- The American telecommunications environment is far less regulated than in Canada with the result that certain telehealth programs used in the United States are either not permitted or are not cost competitive in Canada. For example, the American Health Network is funded through advertising revenues. This source of revenue is not now permitted on Canadian pay cable channels.
- There are more private hospital chains in the United States. Individual hospitals in the chain feel the need to communicate with other hospitals in the same chain. There are a few similar situations in Canada.
- Because of privately owned hospitals in the United States, there is more competition between health care providers within a community for both patients and physicians. Thus there is less chance of shared services within the same community and also, greater incentive to provide telehealth services if they will attract patients or physicians.

#### Recent Developments in the U.S.

In the United States, telehealth has now developed beyond the provision of health care delivery to include health education to the consumer public and programs for continuing professional education. Examples of this are the U.S. Cable Health Network which is a 24-hours satellite delivered service distributed by



cable companies to homes across the United States with programming strictly dedicated to health, science, and better living.

A second relatively recent development is the inexpensive provision of medically useful clinical databases to practising physicians through the GTE/Telenet data network. Physicians in any of the major urban centres can use a standard ASCII data terminal to obtain information about drugs, diagnoses, literature citations and abstracts, as well as continuing medical education programs.

A recent third development is the announcement by the American Network (a division of American Medical Buildings) that it plans to provide satellite delivered information and entertainment services tailored exclusively to American hospitals. This system has also been used for a series of 10 teleconferences aired at 55 cities.

#### Telehealth Trends

From our review of the past history of telehealth in Canada and the United States, a number of significant trends emerge:

- the slow transition from government funded clinical trials to products developed by the private sector for a mass market is expected to continue.
- the strong interest in the private sector in getting into the telehealth market at the ground level. There is a rush by hospitals, government agencies and private companies to get an early foothold in what is seen as an important and lucrative market.
- products which are being developed are those which demonstrate commercial viability or receive a commitment from government for long-term support.
- there is a large and slowly growing cadre of people in Canada who are knowledgeable about the capabilities of telehealth. These people are taking an active role in diffusing telehealth information to a broader end-user audience and stimulating a user demand for services.

- future telehealth applications will involve combinations of different technologies to provide products matched to user needs. For example, the various links in regional networks being developed for health care delivery to northern and rural communities employ a variety of narrowband and broadband technologies to match the needs and available resources for each link in the network. Similarly, data networks are using various combinations of packet switching, broadcast and cable television, videotext and personal computer technologies to produce total systems that are inexpensive and simple to use.
- telehealth continues to be caught in a perpetual chicken and egg dilemma: many applications are not cost-effective unless they are provided to a mass audience; however, there is no mass audience for many telehealth applications because they are not cost effective. If this cycle can be broken either by reduction in the costs or the provision of a large consumer market, then there is a potential for a very rapid growth in market demand for telehealth services.
- whereas previous telehealth applications were technology driven with solutions looking for problems, current approaches focus on user needs and finding the optimal mix of technologies to meet those needs.

### 3.3 Summary of Survey of User Needs for Telecommunications

An important component of the study was a survey of the health care industry, including telehealth providers and consumers, to establish user perceptions of the need for telehealth services. We interviewed approximately 90 people of whom approximately 80% were located in Canada, the remainder involved contacts in the United States. By far, the greatest percentage of the interviews were completed in Ontario. This is partly because of the relatively large number of active telehealth projects in Ontario, but mainly because of the number of national institutions (including the Federal Government) located in Ottawa.

EXHIBIT 4

DISTRIBUTION OF INTERVIEWS BY PROFESSION

<u>Profession</u>	<u>*Percentage (%)</u>
Physician	18
Nurse	1
Dentist	1
Pharmacist	1
Administrator:	
- Hospital/Health Care	43
- Business Sector	18
- Provincial Government	18
- Federal Government	12
- Utility	6

\*\*Percentages will not add up to 100 as some interviewees were in more than one category.

A good cross-section of the health care field was reached including representation from physicians, nurses, dentists, pharmacists, as well as their provincial and federal bodies. We spoke with the hospital associations provincially and federally plus the public sector and the utility companies such as Bell Canada and Manitoba Telephone (Exhibit 4).

In almost every case, the respondents were extremely co-operative and most were enthusiastic about the future prospects of telehealth. However, private sector firms were understandably cautious about providing any specific market or cost information which could lessen their competitive position in the market.

Defining needs presented a certain amount of difficulty to most of the interviewees, particularly in the area of market definition and quantification. Applications were identified but very few were able to supply good estimates of costs, benefits, or potential volumes.

During the interviews, a recurring concern of prospective users of telehealth applications was the relative costs of telehealth systems compared with conventional approaches and; more importantly, the question of how these new services were going to be funded.

Most of the hospitals and health care institutions operate on specific and frequently limited budgets and grants, hence cost and funding becomes an important consideration. The general consensus of members of the health care community was that outside funding (government or other funding agency) must be available to

EXHIBIT 5

NEEDS IDENTIFICATION

<u>APPLICATION</u>	<u>TOTAL POINT VALUE</u>
EDUCATION:	
PROFESSIONAL	127
PUBLIC	16
PATIENT/HEALTH CARE	92
ADMINISTRATION	48
SOCIAL	5

Grid value: First choice = 3 points  
              Second choice = 2 points  
              Third choice = 1 point

cover the initial expense of setting up a telecommunication system in order to take advantage of the available technology. In many cases, there are existing revenues which can be used to partially fund ongoing costs; for example, updating information in the poison control centre, interpretation fees for x-rays, registration fees for continuing education courses, etc. Also, reductions in operating expenses will further aid in defraying ongoing expenses; for example, travel costs in terms of personnel time and fares can be reduced through teleconferencing. These savings can sometimes make teleconferencing cost justified. We will explore the funding issue more fully in a later section.

In order to summarize the needs expressed in the interviews, we reviewed our completed interview questionnaires and assigned a first choice need 3 points, second choice 2 points and third choice 1 point. These scores were then totalled and displayed in Exhibit 5 opposite.

Our interviews and literature survey demonstrated that the health care community believe that there are real needs for telehealth principally in the areas of education, health care delivery, and administration and that each of these applications is uniquely different.

In order of importance and frequency of identification, the following were the applications and needs identified by the user community (Exhibit 5):

1. Education - Professional

Continuing medical education was consistently named as the major focal point for a telecommunication application. This would include formal lectures as well as grand teaching rounds and other practical sessions. The need for continuing professional education for physicians, nurses, and all health professionals is a result of the rapid growth and dissemination of new concepts in health care practice (investigation and treatment) and the constraints and cutbacks imposed in recent years on continuing professional education budgets within hospitals and health care institutions. This has come at a time when increased demands are placed on doctors, nurses, and health care professionals to develop specialized knowledge and skill sets.

2. Health Care Delivery

The requirement for remote consultation and diagnostic facilities was high on the list of priority projects. Other health care areas such as centralized poison control and drug information data bases were of equal importance. In the field of health care delivery there is ample evidence of regional disparities in the availability of specialized health care providers (e.g. psychiatrists, geneticists, speech therapists, etc.) and high technology investigative tools. In examining existing provincial arrangements for acute hospital care, cancer treatment,



mental retardation treatment, psychiatric care and rehabilitation treatment, there are numerous examples of differences in the level of expertise in major urban centres compared with rural or remote centres. This disparity will always exist and hence there will be a continuing need for telecommunications to support the delivery of diagnostic and consultation services in underserviced areas and to provide administrative support for flows of patients and patient information.

3. Administration

Many organizations and associations felt that committee meetings and conferences could be replaced by a form of teleconferencing, limiting travel to a regional centre. The administrative needs of national and provincial organizations and associations (hospital, medical, nursing, dental) also include the collection and dissemination of information to constituents and, more recently, the maintenance of central reference databases.

4. Education - Public

Education of the general public in relation to health care, fitness and nutrition, etc. was presented as a viable telecommunications market, frequently in conjunction with a professional program. This could be presented, for example, via a "Health Network" (public and private). With generally increased public awareness of the importance of lifestyle in health maintenance and disease prevention,

there has been a corresponding growth in the market for consumer health education.

5. Other

Some social aspects were identified such as the need for patients from remote Northern communities to interact with their families verbally and visually.

Although these varied needs do exist, we found people interviewed were unable to clearly define and quantify their needs. Furthermore, many of the advantages of telecommunications in meeting these needs are in intangible areas such as "improved support" for nurses or physicians in remote locations, or "improved accessibility" to current drug or other information.

Various technologies were discussed as presenting solutions to the suggested applications. No one solution is nor will be the perfect answer to all. All of the technologies, be they narrowband or broadband, will be important in the future. Interviewees felt that the key ingredient is the analysis of the application and the establishment of precise objectives for each project in order to select the most viable solution.

3.4 Summary of Findings from Data Collection

Based on our literature review, personal interviews, and telephone survey of user needs, we have reached a number of conclusions which are important for the future formulation of system concepts:

1. The field of telehealth is not a single homogeneous discipline; it is, in fact, made up of many different applications and user groups. Therefore, no one single technology or small group of technologies will meet all needs.

A wide variety of technologies have been employed for the delivery of telehealth services. These technologies can be conveniently grouped into progressively broader bands of information and include: telephone, audio teleconferencing, audio and video messaging using narrowband techniques and conventional land lines or broadband techniques using either cable or satellite systems, and data networks. Typically, a variety of approaches are feasible and the technology selected is often a function of what is available or what the funding agency wishes to employ.

2. There is intense activity in the field of telehealth in Canada and the United States. Previous efforts have been of a research or experimental basis and have been funded to varying extents by the federal government (the Department of Communications and the Department of Health and Welfare) or by research grants (the Donner Foundation). Now, telehealth applications are being developed by the private sector (such as cable companies, telephone companies, or drug and hospital supply distributors) or by provincial governments (most notably in Ontario) which have actively sponsored telehealth developments. In our survey, we found

intense and broad interest in the field of telehealth both by potential service suppliers and recipients.

3. The applications tended to focus into one or other families of telecommunication technologies whether teleconferencing, cable systems, slow scan TV, broadband (land and satellite), or data networks. More recently, users are successfully uniting technologies; for example, the Knowledge Network in British Columbia and the Northeastern Ontario Network combine cable broadband systems at a central "hub" with satellite broadband links to remote centres. Similarly, Telidon databases can be merged with data networks to provide clinically useful databases at reasonable cost.

4. Users were generally cautiously optimistic about the future of telehealth. Most experienced suppliers were pessimistic about the cost-effectiveness of telehealth systems unless costs decline appreciably. Many users were very pragmatic and expressed concerns about the barriers (cost, medico-legal, and political) to the future acceptance of these systems. Several people interviewed suggest that telehealth is a technological solution looking for problems to solve.

Most providers suggested going slow in the introduction of telehealth applications but at the same time were scrambling to get into the market at the ground level to secure a niche for themselves.

5. In contrast to other technologies, such as computers, where there is the potential for capital substitution of labour, in telehealth most of the costs are additional, and most of the benefits are intangible in fulfilling unmet needs for education, health care, delivery, administration, and social relations. Generally, telehealth provides new or additional services that are not currently available. For example, the broadband networks to northern communities and nursing stations makes available specialist support and high technology tools that can never be provided otherwise to such a diffuse user base. There have been several efforts to establish the cost effectiveness of telehealth systems and most projects were unable to demonstrate substantial cost savings.
6. A national picture of telehealth users emerges which indicates a general lack of coordination between users in different technologies or different regions of the country. To date, the telehealth team within the Department of Health and Welfare is the sole clearing house for information on current developments. National organizations such as the Canadian Medical Association, the Canadian Hospital Association have been involved in the collection and dissemination of telehealth information pertinent to their constituents. The CMA has maintained a "watching brief" through the office of Continuing Medical Education and the CHA has retained a Director of

Communications. In addition, the CHA has undertaken a number of projects in continuing education and in the creation of Telidon databases for a medical devices alert and poison information service. There is a need to provide a forum for ongoing dialogue between the various participants in the telehealth industry. Review papers are a valuable source of telehealth information, however, these review papers need to be continually revised and updated to reflect the rapidly changing nature of telehealth. Conference and symposia such as the Health and Welfare sponsored "Telehealth - Update and Applications" in November 1980 in Ottawa, or the CHA Communications Workshop in February 1982 are also important forums for sharing of information.

7. Most technologies needed for the support of telehealth are in place and are generally improving in price and performance with time. Teleconferencing equipment is generally available and well supported. The Telidon protocol for the display of alphanumeric (textual and graphic) information continues to evolve to a North American standard (NAPLPS). Data networking employing packet switching makes databases and electronic mail services accessible to the majority of hospitals and health care providers and becoming available at reasonable cost. It is clear that telehealth has been technology driven and every new technological breakthrough,

particularly those that reduce cost, opens up new alternatives for the delivery of telehealth services.

8. Telehealth is a constant dynamic involving new technologies (data networking, digital switching, satellites, fiberoptic transmission), new applications (consumer health education, national databases) and a shifting regulatory environment (the CRTC hearings on specialty cable channels, the CRTC hearings on value added services). The constantly shifting nature of telehealth is further justification for maintenance of a central clearing house of current information on providers, users, and technological innovations.



#### 4. DEVELOPMENT OF SYSTEM CONCEPTS

The data collection process produced a tremendous amount of information about the health care system in Canada, the previous, current and planned telecommunication applications in health use, and the many technologies which are now available to meet these needs. This information was then analyzed and synthesized to identify four major system concepts which have the greatest potential and merit further more detailed analysis.

##### 4.1 General Approach

In order to develop these system concepts we used a four staged approach:

1. We first developed a comprehensive communication matrix showing the major types of message senders and receivers in the health care industry and the types of messages which might be sent. This matrix was suggested by the Telehealth Team of Health and Welfare Canada as a way of insuring that all communication needs were considered in the first analysis.
2. We then clustered the various senders and receivers into six broad groups of potential markets for telehealth applications. The telehealth applications were similarly grouped into four major categories. Each mode in this application matrix was then described in greater detail to include:

# EXHIBIT 7

## APPLICATION MATRIX

1. Health Education			2. Health Care Delivery			3. Administration	4. Social
Markets	1.1 General	1.2 Preparatory	1.3 Continuing	2.1 Consultation	2.2 Diagnosis	2.3 Information Services	
A. Consumer	Preventive		As in 1.1				Recruiting members
- General	- diet, lifestyle						Advocacy
- Networks	Public Health						Consumer polls
	Pre & Post natal						Ombudsman
	Disease specific						
	- diabetes, cancer, heart						
	- disabled						
	First aid, poison						
B. Institutions	Preventive		In-service education			Macro Organ Retrieval and Exchange	Intra Institutional transfer arrangements
- Hospital	- diet, lifestyle		staff (nursing, lab)				Share Services
- Nursing home	Public Health		Interhospital				
- Rehabilitation centres	Pre & Post natal		teleconference				
- Mental retardation facilities	Disease specific		Teaching rounds				
- Visual or hearing impaired	- diabetes, cancer, heart		Pharmacy bulletins				
- Correctional institutions	- disabled		Occupational health				
- Day Hospital	First aid, poison		Laboratory technicians				
- Home Care							
C. Government	Health Benefits					Military	Statistics
- Federal	Resources						Financial
- Provincial							Legislation and Announcements
D. Professionals		Professional undergraduate education	Sounds	Remote Consultation	Pacemaker	Drug Information Service	Business or Committee meetings
- Doctors (GP, FP, Specialists)			Journal Clubs		Ambulance	Poison Control	Billing claims submission
- Nurses (RN, RMA, Specialty)			Topic specific programs		ECG	Disease Incidence	Job Search
- Other Health Prof.			Abstracts		EEG		
- Physio					Diagnostic imaging		
- Speech					Speech		
- Occupational							
- Technicians							
- Veterinarians							
E. Associations			Association sponsored courses to members				- Management and Planning information
- National							- Computer services to member institutions
- Provincial							- Conference organization and arrangements
- Regional							- Labour arbitration rulings and salary settlements
F. Private Sector							- Surveys of member institutions
- Drug Companies			New Product Announcements		Compendium of Pharmaceuticals	Hospital Supplies	
- Hospital Supply Distributors			Drug Information ("The Medical Letter")		Specialties	Price Information	
- Medical Equipment Suppliers			Druggists				
			Therapeutics				
			Medical Services				

- perceived user needs;
- potential consumers/receivers;
- potential providers/senders;
- estimates of market size;
- current delivery methods;
- alternate delivery methods;
- likely future delivery methods.

We then looked at this matrix from another perspective and developed technology matrices which summarized for each telecommunication technology the applications and target markets which might be considered appropriate.

3. In the third stage we examined the previously developed application and technology matrices and identified four system concepts which had the greatest future potential on the basis of cost, reliability, simplicity, performance, and potential impact on the health care system.

4. These four system concepts were then developed further in terms of describing prototypical systems, potential markets, cost parameters, and potential benefits.

#### 4.2 Communication Matrix

The communication matrix (Exhibit 6 opposite) demonstrates the major participants in the health care system, the tremendous variety of telecommunication needs and the fact that two participants can have different needs depending on the direction of the message. For example, associations may want to send continuing education programs but receive member opinion polls. Associations and governments by their nature are collectors and disseminators of information and often the medium used for each activity is different.

#### 4.3 Application and Technology Matrices

In order to develop a better framework for analysis of telehealth needs, the various senders and receivers were clustered and an application matrix was prepared (Exhibit 7) showing the major categories of telehealth applications and target markets for these services.

The individual intersections of this matrix were then described in greater detail to include:

- Needs;
- Consumers;
- Providers;
- Market size;
- Current delivery;
- Alternative delivery; and
- Likely future delivery method(s).

This detailed description is provided as Appendix 1.

This application matrix was then analyzed from the perspective of what groups of markets and what categories of application were appropriate to various types of telecommunication technology. These tables which conform in layout to the application matrix are included as Appendix 2.

The likely future delivery method was estimated from our survey of activities in the telehealth field and our estimate of future trends. In most cases, future delivery methods will supplement rather than replace current methods.

#### 4.4 Selection of System Concepts

The application and technology matrices were reviewed by the study team and judgements were applied as to the relative cost,

reliability, simplicity, performance and potential impact on health care in Canada of each of the intersections in the applications matrix. These judgements were then applied to estimate the four general system concepts which we believe are the most promising and deserving of more detailed investigation.

## 5. SYSTEM CONCEPTS

In order for a telehealth application to be successful it needs to meet the varied needs of a wide audience in a cost-effective, simple and reliable manner. We have identified a number of system concepts which we believe offer the greatest promise and warrant further investigation. These include:

1. Data Networks
2. Regional Networks for Health Care Delivery
3. Audio Teleconferencing
4. Cable TV Networks for Public and Professional Health Care Education

### 5.1 Data Networks

#### 5.1.1 Example

An understanding of how a data network would support telehealth can be obtained by looking at the example of the GTE Telenet Medical Information Network (MINET) which consists of two services: AMA/NET databases licensed and maintained by the American Medical Association, and MED/MAIL, an electronic messaging service. The services currently provided or planned for 1983 include:

1. Drug information database
2. Disease information
3. Medical procedure coding and nomenclature
4. Socio-economic bibliographic information
5. Excerpta Medica Physician Information Retrieval and Education Service (EMPIRES)

6. Diagnostic Awareness Service
7. Current Awareness Service
8. Continuing Medical Education provided by Harvard Medical School/Massachusetts General Hospital
9. Laboratory Test Information

#### Bulletin Board

1. Electronic messaging to groups of subscribers (university, handicapped facilities)
2. Centre for Disease Control disease alerts
3. Food and Drug Administration - drug alerts

#### Scripting

1. Enrolment in C.M.E. courses
2. Ordering of AMA publications
3. Adverse drug reporting
4. Polling of members organizations

In addition to the above AMA sponsored activities, the GTE network is providing a commercial drug advisory service including advertising and new product announcements funded by a group of drug companies.

#### 5.1.2 Canadian Prototype

If one looks at the network structure of health care systems in Canada (summarized in Appendix A) it is clear that such a data network offers tremendous potential for Canada. A useful construct would include a data terminal in the emergency department and hospital library of every hospital in Canada. The terminal device itself could be either a standard ASCII terminal, a teletype device, or a personal computer equipped with a telecommunications interface.



A Telidon terminal could also be employed if the databases adhered to the Telidon protocol.

The network offers the potential to tie together professionals and institutions into local, regional, provincial, or national networks. Because the communication costs for such a system base on a packet-switched network are only less distance sensitive than conventional telephone service, it is feasible to introduce the service as a single national network. As utilization of the network increases, it may become more cost-effective to break it into regional modes at a later date. If one were to place a terminal in the emergency department or library of every health care institution the network would be available and visible to hospital and health care administrators and a range of health care providers. The true value of such a network lies in the universal availability of information on a "need to know" basis - various classes of users could select databases to access current information to meet their particular needs.

The providers of database material would logically be the national and provincial professional associations (hospital, medical, nursing, dental, etc.). Content of databases include information on:

- drugs
- poison
- therapeutics
- labour arbitration
- salary and wage settlements
- literature abstracts and citations
- medical devices alert
- disease alert
- occupational health and safety

Natural applications for the messaging, bulletin board and scripting services include:

- Professional education notices
- Self evaluation programs
- Ordering of materials
- Disease Surveillance
- Adverse Drug Reporting

In Canada the medium to use would be packet switched networks which provide the widest access at lowest cost. These are available through CNCP (Infoswitch network) and Bell Canada (Datapac).

The corresponding electronic messaging services are Infocall and Envoy 100. In addition, Bell Canada has recently announced iNet 2000 which provides a simple and convenient access mechanism for an individual user to various databases and electronic messaging services. (Enclosed in Appendix I).

#### 5.1.3 Market

The target market for this service would be the 1400 health care institutions, 42,000 physicians, and other health care professionals. Access to the network is through a variety of simple terminal devices:

1. A dumb ASCII terminal
2. A displayphone
3. A Telidon terminal
4. A personal computer equipped with an interface board
5. A teletype device

#### 5.1.4 Costs

Sample charges for database access are provided by GTE Telenet and iNet and include various categories of charges:

Subscription fee	\$100
User registration fee	\$25/user
Usage charge	
Database	\$27/hour
Electronic Mail	\$7-16/hour
Other charges	Variable

If a user is accessing only four or less databases then Datapac/Envoy 100 (or Infocall) is preferred. For the user who wants access to many databases, iNet is more appropriate - iNet currently provides access to over 400 databases and this is projected to grow to 800 by next year. In Canada the iNet surcharge would be an extra \$3.60/hour for the administrative services of collecting usage charges from various databases and condensing them into a single client bill. In July 1983, Bell Canada completed a field trial of 400 iNet users to prove the technology and they have begun an 18 month field trial with 1500 users to assess the market for this service.

#### 5.1.5 Benefits

While the benefits to individual practitioners and institutions are hard to estimate it is clear that the value of the network will grow as the number of users increases and the number and variety of useful databases increases. Just as the value of the telephone system depends on its universality so the value of a data network to a particular organization depends on the market penetration of the network to its members. Similarly, the cost effectiveness of the electronic messaging is volume dependent. The following example illustrates that there are economies in large mailings:

	One Destination	10 Destinations
Cost to create	.30	.30
Cost to send	.35	3.50
Total cost	.65	3.80
Unit cost	.65	.38

We have tried to estimate the costs and benefits of such a network but the tremendous variety of assumptions regarding fee rates, usage patterns, and database development costs preclude a reasonable analysis.

#### 5.1.6 Organization

Program material could be developed by the national or provincial organizations in connection with private companies such as Infomart which are organized to develop and distribute databases.

An added advantage to Canadians is the fact that these data networks accommodate the Telidon graphics protocol and so Telidon terminals (approximately \$2,000) or personal computers (IBM-PC, Apple) equipped with Telidon interface boards (now available for \$500) can be used to access the many current and planned Telidon databases.

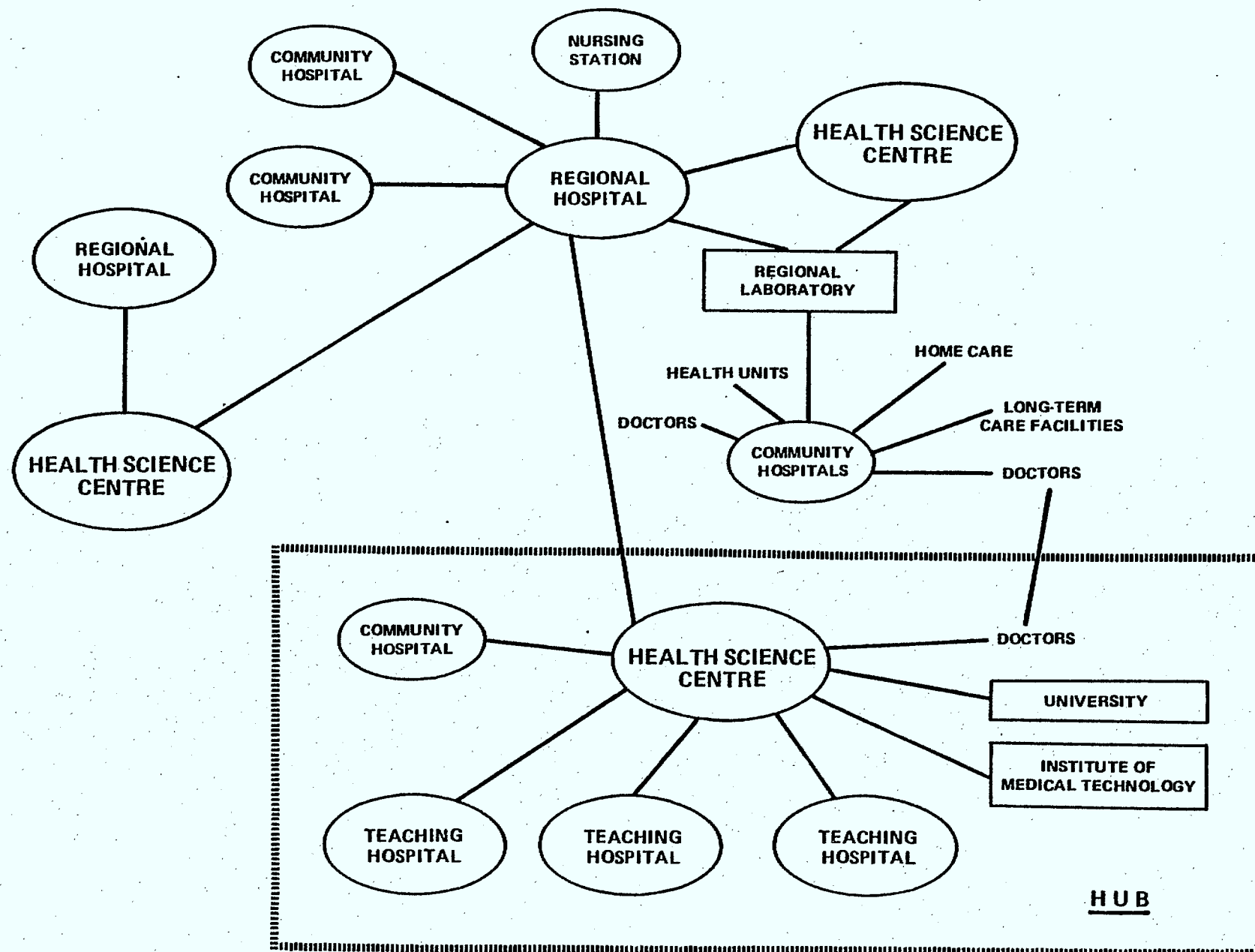
### 5.2 Regional Networks for Health Care Delivery

As a means of delivering health care services including consultation and diagnostic support between rural and urban areas, as well as continuing professional education, a variety of regional telecommunications networks have been tried and developed (particularly through the Hermes and Anik B experiments and through the Ministry of Health in Ontario).

#### 5.2.1 Example and Canadian Prototype

The particular system concept that appears to offer the most promise is exemplified by the approach taken by the Telehealth

Exhibit  
NETWORK OF HEALTH CARE FACILITIES



Program in Ontario. It is based on a network model of health care delivery (Exhibit 8) where particular links in the network can evolve and change to reflect changing technology or usage patterns (clinical care or education) and the technology is selected relative to identified needs. The system will incorporate a "hub" composed of broadband linkages between hospitals in a regional centre using either land-lines or microwave systems. The hub would then be connected through the Ministry of Government Services broadband link satellite or microwave to other parts of the network. Outlying rural hospitals would be connected to the hub through land-line for two-way audio and slow-scan video. A further important concept is that of shared management wherein each health care facility within the network is an active participant in establishing policies, procedures, and priorities. This approach may be achieved by the incorporation of a company for the purpose of delivering telehealth services with representation from all interested parties. This is a departure from the usual model of a "champion" developing an interest in a particular technology and promoting it. Although the network approach is slower to develop because of the need to educate potential users on the capabilities and uses of telehealth and the need to develop consensus it has the greatest chance for long term success.

#### 5.2.2 Narrowband vs Broadband

In the debate concerning the relative merits of narrowband (2.4 to 9 kilobits/second) and broadband (4,800 kilobits/second) it would seem that from the perspective of cost, reliability and availability, narrowband using two way audio and one way video seems to be the most economically viable technology. It satisfies the major needs of the users for a fraction of the cost of

broadband. The ideal system, as suggested by F.A. Roberge\*, is a compromise between the two extremes that supports transmission at 50 kilobits/second resulting in a high resolution image in less than 15 seconds, or low resolution images for interactive exchanges at the rate of one every 4 seconds. The ability to purchase as much of a band width as is needed, and to buy as much channel time as required is now technically feasible and commercially available in the United States. Because of Canada's regulatory environment, most potential broadband users must purchase total and exclusive use of a channel. The substantial channel costs imply a need to work through an existing provincial broadband network in order to share costs with other health and non health users.

The growth in digital exchanges and changing regulations may open up new markets for telehealth delivery. Until this occurs the broadband link will only be cost justified on heavily used portions of the network.

#### 5.2.3 Markets

In regional health care delivery networks the applications will span the full spectrum of diagnostic, consultative and continuing professional education activities identified earlier (Exhibit 9). The service user will determine content and usage patterns and the regional referral centres will provide the first line of support. Support from major referral centres will only be sought

\* F.A. Roberge, "Telemedicine in Northern Quebec" CMA Journal/Oct. 15, 1982.



on an as needed basis. This network approach to providing telehealth services will build upon and strengthen existing patterns of referral.

#### 5.2.4 Costs

The exact costs for such a system again depend heavily on assumptions about usage and technology employed. A sample budget for the Northeastern Ontario Telehealth Network show capital expenditures of approximately \$250,000 and annual operating expenses (exclusive of satellite channel costs provided free) of \$300,000 a year.

#### 5.2.5 Benefits

The major benefit of health care delivery applications is the ability to provide the specialized and high technology consultation and diagnostic services to areas of Canada that cannot justify or support these types of services locally. The net effect is to use telecommunications to provide services and to meet the health care needs of those areas of Canada which have historically been under-serviced with little hope of improvement. There are several benefits to the profession of these kinds of services:

- it reduces the need to transfer patients to secondary or tertiary care treatment centres;
- it provides important education and moral support to local physicians in remote communities;
- it permits patients to be tested in their own communities and so reduce the social disruption of patient transfers; and
- it strengthens existing arrangements for the regionalization of health care that is so prevalent in the Canadian health care system.

### 5.3 Audio Teleconferencing

#### 5.3.1 Example and Canadian Prototype

A third major system concept relates to the development of audio teleconferences with or without video support. The best prototypes for this kind of system are the teleconferencing systems employed at:

- Memorial University, Newfoundland
- Health Region III, New Brunswick
- University of Calgary
- Toronto General Hospital/Royal College of Physicians and Surgeons

The key features of these systems are the linking of rural hospitals with one or more regional centres to provide short sessions (1-2 hours) on special topics. Individual bridging devices usually have a capacity of 10 to 20 ports which can be used in any combination to support simultaneous independent conferences. For example, with a bridge of 20 ports one could have 2 conferences to 8 and 12 centres or 4 conferences to 5 centres each. Similarly, one bridge can be connected to another so that, for example, the Newfoundland and New Brunswick bridges could be connected. A variety of handbooks are now available to guide prospective users on how to use the medium most effectively.

#### 5.3.2 Markets

The systems have been used mainly for continuing professional education and administrative purposes such as monthly association or committee meetings. The relatively large number of these systems indicates their wide and growing acceptance as an important element of the health care system. Consumers include

physicians, specialists, nurses, physiotherapists and medical technologists. The format usually conforms to an educational round with case presentation followed by discussion. The medium is usually 2 way audio with audio-visual aids precirculated by mail or courier. The total attendance ranges from 5 to 60.

#### 5.3.3 Costs

Average costs have been estimated at \$50-\$60/hour of program. Bell Telephone sells Conference 300 at a fixed monthly fee of \$250 plus \$35 per line up to a maximum of 10. Similar services are available from CNCP. The Toronto General Hospital Telemedicine Project charges \$8 per site, per hour plus a \$4 per site, per hour surcharge for week nights and weekends. For this project the annual operating budget is \$100,000 and startup costs were estimated at \$60,000. Funding for these systems is usually on a user pay basis with initial capital expenses met by the sponsoring agency or government.

#### 5.3.4 Benefits

The major benefits of audio teleconferencing are the reduction in travel costs associated with conducting regional or national meetings, the strengthening of regional and provincial consultation and education programs, the convenience of holding regular regional rounds or meetings, and the educational opportunities provided to all health professionals in their own communities: a physician, nurse, laboratory technician, etc., in a remote location, can connect with their peer groups for education purposes or case conferencing.

#### 5.3.5 Organization

Many of the audio teleconferencing bridges to date have been located in hospitals with funding, administrative support and program scheduling provided by the hospital, local health sciences centre, and professional associations. For example, the Toronto General Hospital Darome Bridge is a joint program of the Hospital, the Ministry of Health, the Royal College of Physicians and Surgeons and the University of Toronto. In the future, Bell Canada and other telephone utilities may also become major providers of audio teleconferencing to the health industry, if the price and quality of their service is comparable to other product offerings.

#### 5.4 Cable Networks

##### 5.4.1 Example and Canadian Prototype

A fourth system concept which has potential is the use of Cable TV for the provision of consumer health education and professional health education. A number of prototypes exist for such a system including:

- the American network
- the Cable Health Network, California
- the Knowledge Network, British Columbia
- the Canadian Health Network, Ontario
- the Ontario Education and Communication Authority - TV Ontario

The need for continuing professional education has been referred to earlier. The need for consumer health education is equally important and is an outgrowth of a growing awareness on the part of consumers and health care professionals alike on the importance of preventive medicine. The discussion document "A New Perspective on the Health of Canadians" published by the then Minister of Health, the

Hon. Marc LaLonde, emphasized among other things, the importance of lifestyle. Health promotion and health education have since had a significant impact on disease prevention through programs for:

- seat belt promotion
- smoking cessation
- drug and alcohol addiction
- obesity control
- malnutrition prevention
- exercise and fitness promotion
- careless driving control

In Canada, the Canadian Health Network is one of a number of groups which has filed an application with the CRTC to provide a combination of consumer and professional health education services. This service would be available 24 hours a day, 7 days a week in both English and French. Transmission from studios in Toronto and Montreal would be via Anik-C satellite to cable distribution points.

#### 5.4.2 Markets

The market for cable services are the general consumer markets supported by cable and selected target markets such as hospitalized patients or remote communities with cable services (project Iron Star).

The key factor in the success of this system will be the ability of these channels to obtain CRTC approval for advertising revenues. An initial notice filed in May 1983 calling for new specialty programming services refers to the potential for both subscriber and advertising revenues.

#### 5.4.3 Costs

Costs for a specialty cable channel devoted to health programming can be divided into development costs and ongoing

operating and production costs. Initial costs relate to the acquisition of a CRTC broadcast license and include office overheads, salaries, research, consulting, legal, and accounting fees. We estimated these initial costs at between \$300,000 and \$600,000. Once a license has been obtained, initial program production costs depend heavily on whether program material is produced locally or acquired from the United States. In either case, program development costs can easily exceed \$500,000 per month with the potential of a first year capital requirement of between \$6 million and \$8 million.

In order to support this level of expenditure, such a specialty cable channel will require offset revenues. These could come from advertising sale of time slots to associations or professional groups, sponsorship of programs (as in the American PBS network) and secondary sales of program material. A final and important potential source of revenue is from cable subscribers themselves either through direct fees or from the cable company distributors. The CRTC in a recent decision rejected specialty programming services which were user-pay on a non-discretionary basis. Consideration may be given in the future to a tiered system where specialty programming would be available as a discretionary user-pay service.

#### 5.4.4 Benefits

The major benefits, which are as yet poorly quantified, relate to the improvements to the health of Canadians through widely accessible health promotion programs. Governments at both the Federal and Provincial level are emphasizing the importance of

self-responsibility and self-care behaviours in improving lifestyle and reducing morbidity and mortality. Some of these activities centre on identified problems such as:

- Alcoholics Anonymous
- Weight Watchers
- Smokers

Other activities are of a more general nature and include programs on:

- fitness
- nutrition
- relaxation
- environmental concerns
- spiritual growth
- use of seatbelts

The third group of activities relate to general counselling programs where patients with symptoms problems call in to get advice and guidance.

Despite the tremendous growth in literature in recent years related to health prevention and promotion programs, we were unable to identify studies which have quantified the benefit from these programs. This is due to two factors:

- it is hard to establish the actual contribution such programs have in changing behaviour
- even if behaviour is altered, the health benefits that come from stopping smoking or weight loss occur in future time periods and are difficult to quantify

Because of these and other difficulties, various authors have promoted health education programs on the basis of their face validity.

#### 5.4.5 Organization

As outlined in the CRTC call for new specialty programming services, the government is prepared to consider a variety of arrangements "mainly but not exclusively, via satellite-to-cable networks and could be offered individually or through channel sharing arrangements with other interested entrepreneurs. Alternatively, they might be packaged with other services".

Because of the specialty nature of this programming, the CRTC further recognized that "a degree of integration of production and distribution may be the most economically viable means of operation" for these services.

Based on our review of the varied telehealth market, we do not promote any particular organization for the delivery of telehealth program services.



## 6. COSTS AND BENEFITS

In attempting to estimate costs and benefits for the identified systems concepts, it rapidly became apparent that this was not a feasible task without a detailed market study of each system. Two main reasons contribute to the difficulty: the absence of reliable cost and price information and the large number of assumptions, particularly usage patterns and market penetration that influence total system cost. Rather than build cost models based on rather vague assumptions, we prepared a table (Exhibit 10 opposite) to identify the key cost and benefit components and a representative range of values. In looking at costs, we distinguished between one-time costs of equipment acquisition and database/program creation and ongoing support and development costs. Because of the large number of participants in any of these system concepts, the costs may be incurred in varying amounts by the different parties depending on negotiated agreements. For example, data networks may be funded jointly by the telecommunication companies, the national and provincial health organizations, drug companies and governments at all levels. Ongoing revenue may similarly be distributed to hospitals, nurses or physicians, based on usage.

From our review of the literature and our interviews, it became apparent that funding is a key consideration. To date, most telehealth applications have been supported by research, demonstration or government grants with considerable free services provided by major participants, the DOC, H&W, teaching and other hospitals and health

professionals. Furthermore, very few, if any, of the systems concepts has yet proven to be an economically viable concept. For example, the AMA's MINET data network is still in market trial phase with approximately 800 users, the regional networks and cable networks such as the Northeastern Ontario Network, are just getting off the ground, and audio teleconferencing has only been commercially marketed and used for health applications for the last 4-5 years.

In the literature we could not find any telehealth services with a clear and substantial payback to the consumers or end users. The benefits from these services rest mainly with intangibles such as improved support, or improved patient care. The question of cost benefit then becomes whether or not the consumers (physicians, etc.) or funders (governments, advertisers) of telehealth services feel the intangibles related to patient care or education more than offset the costs. Therefore, in order for telehealth to gain wide acceptance, these services will likely need substantial and sustained outside funding, either from governments or from advertisers/promoters.

Furthermore, the costs for these telehealth applications (which provide for improved clinical care, improved professional education, or improved accessibility to diagnostic services) are not necessarily borne by those who benefit the most. Should the consumer public or government pay for preventive health programs? Who should pay for the maintenance and support of drug information services - hospitals, government, drug companies or pharmacists? Most of the systems concepts have related costs and benefits for each participant and funding decisions must therefore be reached by agreement of all the parties involved.

From our review of the various costs and benefits, we believe the system concepts with the greatest chance of commercial success are:

- a national data network involving hospitals, physicians, nurses and other groups of health professionals which would utilize existing and planned American and Canadian (Telidon) databases for a combination of continuing professional education, health care delivery, and administrative functions. These systems are also reasonably cost-beneficial, simple to use, and based on the universally available telephone system. They are already in limited use in the health industry and industry at large, and usage is expected to grow as potential users become familiar with these systems.
- secondly, an audio teleconferencing network, with or without video augmentation, which can support needs for continuing professional education, administrative functions, and remote consultation using slow-scan video. The costs for data network access and usage are relatively low and continually declining and the needs of the health care industry for selective access to information (on a need to know basis) continue to increase.

EXHIBIT 11  
TELECOMMUNICATIONS IN CANADA

MAJOR COMMON CARRIERS

Telecom Canada  
Other Telephone Companies (not  
members of Telecom Canada)  
CNCP Telecommunications  
Teleglobe Canada  
Radio Common Carriers

MAJOR EQUIPMENT MANUFACTURERS

Northern Telecom Limited  
AEL Microtel  
Mitel  
Spar Aerospace  
Canada General Electric  
Motorola Canada  
Canadian Marconi

GOVERNMENT REGULATORY BODIES

Canadian Radio-television and Telecommunications Commission (CRTC)  
Alberta Public Utilities Board  
Saskatchewan Public Utilities Review Commission  
Manitoba Public Utilities Board  
New Brunswick Public Utilities Board  
Nova Scotia Public Utilities Board  
Prince Edward Island Public Utilities Commission  
Newfoundland Public Utilities Board  
City of Edmonton  
Ontario Telephone Service Commission  
Regie des services publics du Quebec

## 7. REGULATORY AND OTHER BARRIERS TO TELEHEALTH DEVELOPMENTS

The regulatory environment for telehealth applications must satisfy the dual needs of the health care system and the telecommunication industry. The complex regulatory environment for the Canadian health care system is discussed in detail in the Description of the Health Care System in Canada attached as Appendix A. This section will therefore concentrate on the general structure of the telecommunications industry, the major participants, the regulatory environment, and recent policy changes pertinent to each of the four systems concepts identified earlier. We will also discuss the non-regulatory barriers to telehealth developments in Canada.

### 7.1 Structure

There are two major sectors in the industry; the suppliers of services including the telecommunications carriers and the radio common carriers, and the telecommunications equipment manufacturers. A third player in the total picture is the government, which has a significant influence over both sectors of the industry. Exhibit 11 opposite outlines these major participants.

Telecommunication services are provided by both privately and publicly owned common carriers. Some fall under federal regulation, others under provincial jurisdiction. Telecom Canada (along with the other telephone companies) and CNCP Telecommunications provide facilities for the transmission of voice (telephone) and non-voice traffic (telegrams, telex, data, video), while the radio

common carriers supply mobile communications (mobile telephone and paging radio) services. Telephone constitutes the major portion of telecommunications traffic, although specialized services show rapid growth. Bell Canada, by far the largest of the telephone companies, is the dominating force within the service sector.

## 7.2 Major Participants and Their Market

### 7.2.1 The Carriers

The two major telecommunications carriers are CNCP Telecommunications (CNCP) and Telecom Canada. The map on the opposite page shows the major Canadian telecommunication arteries provided by CNCP, Telecom Canada and Teleglobe Canada. CNCP is a partnership of the telecommunications divisions of Canadian National Railways (CNR) and Canadian Pacific Ltd (CP). This partnership was brought about by the increased sharing of CNR and CP facilities to better develop business communications services. Telecom Canada is an unincorporated association of the largest telephone companies across the country. The Association was formed to develop and maintain a Canadian transcontinental long distance telephone network. Telecom Canada and CNCP, together account for approximately 92% of the over \$7 billion telecommunications carriage market.

CNCP Telecommunications is the exclusive supplier of telegraph and cablegram services in Canada. Like Telecom Canada it operates a transcontinental microwave network. Unlike Telecom, CNCP does not operate a parallel system of local distribution loops capable of servicing residential or commercial establishments in volume (for

example, along individual streets of a city as does the telephone network). CNCP competes with Telecom Canada in providing telecommunications services other than telephone and telegraph. For example, the telex services provided by CNCP (which uses the teletype network) compete with Telecom Canada's comparable Teletypewriter Exchange (TWX) service (which uses the telephone system). Both use teletypewriters which send and receive signals and produce hard copy from them.

Although there are over 200 telephone companies operating in Canada, the seventeen major firms account for slightly under 99% of the telephones in service. Ten of these companies are members of Telecom Canada. All of the members, with the exception of the principal Prairie telephone companies and Telesat Canada, are either public or private companies. The principal Prairie telephone companies belonging to Telecom Canada are owned by their respective provincial governments while the federal government and the major telephone companies jointly own Telesat Canada.

Telesat Canada, the domestic satellite carrier, is also a member of Telecom Canada. Telephone companies have limited capacity on their terrestrial systems and will lease capacity on Telesat's earth stations and/or a space segment or "transponder" (a channel on the satellite) for long distance use when their land systems are overloaded or to reach remote locations. Both transponders and earth stations are leased on an hourly or annual basis.

Telesat Canada owns and operates satellites in addition to earth stations which receive and transmit satellite signals. The

EXHIBIT 13

OVERVIEW OF TELECOMMUNICATIONS SERVICES AND CARRIERS

<u>SERVICE CATEGORY</u>		<u>CARRIER CATEGORY</u>
Voice telephony	Public switched	TCTS and other telephone companies
	Leased circuits (private lines)	TCTS, other telephone companies and CNCP
Public message (telegram)		CNCP
Switched Teleprinter and other Text		CNCP (Telex) and TCTS (TWX)
Data	Public switched	TCTS and CNCP
	Leased circuits (private lines)	TCTS and CNCP
Program Transmission	Audio	TCTS and CNCP
	Video	
Paging		Radio Common Carriers
Mobile telephone radio		



system is interconnected with domestic land systems and transmits voice, data, facsimile and radio and television signals. Telecommunications services across the northern territories and remote areas of some provinces are also supplied.

#### 7.2.2 Basic Services

An overview of the services offered by Canadian carrier groups is shown in Exhibit 13 opposite.

Domestic local and long distance voice telephone services are provided by Telecom Canada and other telephone companies. Most Telecom members have border-crossing points and agreements with U.S. carriers for the carriage of transborder traffic. International traffic is handled by Teleglobe Canada.

Telecom Canada and CNCP provide switched teleprinter and other text services. Telex is provided by CNCP and Teletypewriter Exchange (TWX) is offered by Telecom Canada. Both companies also provide facsimile communications services which allow for the transmission of text or graphics over their respective networks.

Two major public, switched data, computer communications network services are Infoswitch and Datapac, provided by CNCP and Telecom, respectively. Both are nationwide. Both are digital data communications networks which offer circuit and packet switching facilities designed for computer communications.

#### Advancing Technology

Digital (numerical/binary code) transmission and switching permit the integration of voice and data signals. Besides

providing better transmission quality than conventional analog (voice) transmission, it also facilitates communication with computers, binary code being the language of computers. The most recent vintage of switching technology, of which Northern Telecom is a leader, incorporates "time division multiplexing"\* (which uses digital signals) into the switching operation. Northern has a name for its family of switches, "Digital Multiplex System" (DMS). Digital techniques have been incorporated into switching technology so that the distinction between multiplexing and switching is disappearing.

Information services, or "informatics", combines computer data bases with communications networks to transform information services.

Videotex is an example of new "informatics" services. Videotex offers two-way transmission using telephone lines. It allows retrieval of simple information like newspapers, stock market tables, etc. as well as interactive services like electronic messaging, teleshopping and games. Television screens or computers are used to display the information. Graphics can also be generated using Videotex.

---

\* "Time division multiplexing" brings signals closer together so that volume of traffic transmitted per unit of time is multiplied greatly. Versus "frequency multiplexing", based on partitioning of frequencies of electrical waves so several waves of different frequencies can be transmitted at the same time.

EXHIBIT 14

MAJOR CANADIAN TELECOMMUNICATIONS CARRIERS  
AND THEIR REGULATORY AGENCIES

CARRIER

Bell Canada )	Canadian Radio-television and
British Columbia Telephone Co.)	Telecommunications Commission (CRTC)
CNCP Telecommunications )	
Telesat Canada )	
Northwestel )	
Terra Nova Telecommunications )	
Alberta Government Telephones	Alberta Public Utilities Board
Saskatchewan Telecommunications	Saskatchewan Public Utilities Review Commission
Manitoba Telephone System	Manitoba Public Utilities Board
New Brunswick Telephone Co. Ltd.	New Brunswick Public Utilities Board
Maritime Telegraph and Telephone Co.	Nova Scotia Public Utilities Board
Island Telephone Co. Ltd.	Prince Edward Island Public Utilities Commission
Newfoundland Telephone Co. Ltd.	Newfoundland Public Utilities Board
'edmonton telephones'	City of Edmonton
Northern Telephone	Ontario Telephone Service Commission
Quebec Telephone	Regie des services publics du Quebec
Telebec Ltee	Regie des services publics du Quebec
Teleglobe Canada*	
Thunder Bay Telephone System	Ontario Telephone Service Commission

---

\* Teleglobe Canada is not regulated by an independent agency but is owned and subject to control by the federal government.

Source: Department of Communications

Telidon is the Department of Communications' videotex technology. Telidon has been developed to interconnect with the communication networks already in place in Canada, i.e. the telephone lines, microwave, cable television and satellite networks.

Over the last ten years developments in transmission technology have led to the introduction of lightwave communication through glass fibres, or "fibre optics". Fibre cables are smaller, lighter and more flexible than conventional cables and have very high transmission capabilities.

Given the cost and quality advantages promised by optical fibres, many conventional cable producers are interested in the new technology. In Canada the system has been tested in many provinces.

#### 7.2.3 The Regulatory Environment

Major Canadian telecommunications carriers and their respective regulatory agencies are shown in Exhibit 14 opposite.

The entire operations of carriers are regulated by either the federal agency, the Canadian Radio-television and Telecommunications Commission (CRTC), a provincial government public utility board or a municipal council. Carriers must apply to their regulatory agency for approval of the terms and conditions on which service is provided.

Regulatory agency decisions sometimes have a policy impact, particularly when these decisions are made regarding significant issues, ie. system interconnection or terminal attachment.

The federal cabinet has the power to rescind or vary CRTC telecommunications decisions, although this power is used sparingly.

There are also various mechanisms for public participation in telecommunications policy making. DOC periodically publishes notices inviting comments from interested parties regarding policies under review. CRTC holds public hearings on major issues and receives submissions from interested parties. At the provincial level practices vary.

There have been several regulatory issues over the past few years. The question of system interconnection is one. In 1979 the CRTC decided to permit CNCP to interconnect its facilities with the local telephone network of Bell Canada. A further CRTC decision in 1981 granted CNCP the right to interconnect with the facilities of the British Columbia Telephone Company. CNCP, attempting to become more competitive in other areas of the country, continues to request similar interconnection with other Canadian carriers.

In general the movement is towards liberalization of regulation, i.e. less restriction on competition within the telecommunications market. In the U.S.A. this movement towards liberalization is more comprehensive and is occurring at a much faster pace.

#### 7.2.4 Selected Issues

##### 7.2.4.1 New Technologies

The most powerful trend within the telecommunications industry is towards an ever more rapid rate of technological change. These changes are based upon developments in satellite communications, fibre optics and digital transmission and switching.

The new technologies are eroding the traditional monopoly boundaries of the telephone companies and weakening barriers to new entrants to the telecommunications manufacturing industry. This is resulting in pressure for increased competition in the supply of telecommunications equipment and services.

New technological advancements are bringing about the merging of computer and communications technologies and creating possibilities for new communications services. No longer are computers restricted to their specialized applications of the past. Now they can be linked by satellites, fibre optics and digital channels, thereby creating the basis for the information revolution. The range of potential for new services and products based on information technology is huge, i.e. teleconferencing and electronic mail to name a very few.

The application of new technology may affect the structure of industry. The relative importance of different industries in the national economy could change with the emergence of new and the decline of old industries.

#### 7.2.4.2 Licencing of Earth Stations

Rapid growth in the use of telecommunication satellites and in the variety of applications of satellite technology has lead to a less restrictive federal government earth station licencing policy. Previously only Telesat and Teleglobe could own earth stations. As of March 1983, other users have been permitted to own and operate receive-only earth stations. Individual Canadians, as well as commercial establishments or any other organization, are now exempt

from requiring a licence for a television or radio receive-only earth station for receiving programming signals from satellites as long as the signals are not distributed to others. Ownership of transmitting earth stations was previously restricted to Telesat Canada and Teleglobe Canada.

Below is a summary of other elements of the current policy for service with Canadian satellites:

- Licences for all earth stations (transmit-only, transmit/receive, and receive-only) operating with the Canadian satellite system are available to Telesat Canada.
- Other recognized Canadian telecommunications carriers may apply for licences for transmit/receive earth stations operating at 14/12 GHz only.
- Operators at temporary, remote, off-shore exploration facilities may apply for licences for transmit/receive earth stations subject to entering into a connecting agreement with an appropriate carrier.
- Broadcasters and telecommunications carriers may apply for television or radio receive-only earth station licences for the reception of signals whose distribution has been authorized by the CRTC.
- Persons or organizations wishing to receive signals other than radio or television programming (such as news wire services, weather information, stock market information or other business services) may apply for a receive-only earth station licence.
- Resource camps may operate television or radio receive-only earth stations under an exemption from the requirement to obtain a radio licence, if they are eligible for the corresponding CRTC exemption.
- Provincial educational authorities may apply for earth station licences for the reception of Canadian educational signals.

Critics of the government's regulatory policies complain that Telesat services are overpriced and Telecom members receive

preferential treatment. The further liberalization of earth station licencing could open up potential for many new services and would encourage further competition with the major common carriers. Liberalization could also stimulate investment in the equipment needed to implement these new services.

The current restrictions could remain in effect or they could become more liberalized. The decision will have an important impact in the telecommunications industry.

#### 7.2.4.3 Vertical Integration

The corporate link between telecommunications manufacturers and carriers has been under scrutiny in Canada in recent years. The federal government has undertaken studies evaluating the impact of vertical integration on the telecommunications industry.

Proponents of vertical integration claim that such strong ties between manufacturer and carrier are vital to financing R&D expenditures necessary for maintaining the technological advancements necessary to the industry. Opponents claim vertical integration has slowed down innovation in the telecommunications equipment market and prevented the emergence of small independent suppliers by closing off a major share of the market.

In Canada, vertical integration continues in the case of Bell Canada and Northern Telecom, and B.C. Telephone and AEL Microtel. The importance of the carrier as the major market for equipment has lessened, at least in the case of Northern Telecom where its share of sales to Bell Canada has dropped over the last few years.



Bell Canada's desire for continuing close ties to Northern have been reaffirmed by the federal government's decision this year to allow the reorganization of Bell's Corporate structure. The result of the reorganization is the creation of an unregulated holding company, Bell Canada Enterprises Inc. (BCE). BCE would hold the shares of both regulated and unregulated subsidiaries. The primary purpose of the reorganization is to achieve greater separation between Bell's regulated and unregulated activities.

#### 7.2.4.4 Terminal Attachment

Over the last several years, Canada has liberalized terminal attachment regulations.

Under various jurisdictions, attachment of network non-addressing equipment (computer terminal, answering machines) has been permitted for some time. In November 1982, the CRTC issued a major decision which permits subscriber-provided terminal equipment to be attached to Bell Canada, B.C. Telephone, CNCP Telecommunications, NorthwestTel Inc. and Terra Nova Telecommunications systems.

The decision also states that equipment manufactured after September 1, 1983 must meet the technical standards of DOC's Terminal attachment program if it is to be connected to public switched networks. Terminal equipment standards are provided by the Terminal Attachment Program Advisory Committee, which is chaired by DOC. The program's objective is to develop attachment standards suitable for use on a nationwide basis. Standards for terminals are for both non-addressing and network addressing devices.

Exhibit 15

<u>System Concept</u>	<u>Issue</u>	<u>Regulatory Body</u>	<u>Relevant Legislation/Acts</u>
1. Telephone	- high toll rates to northern and remote users	CRTC, Provincial Public Utility Board, Provincial and Municipal Governments	Railway Act Provincial Public Utility Boards Act
2. Data Network	- value added services	CRTC, Provincial Board of Utility	Same as #1
	- rates	CRTC, Provincial Board of Utility	Same as #1
	- transborder flows of information		
3. Audio Teleconferencing	- telephone rates	Same as #1	Same as #1
4. Regional Networks	- physician reimbursement	Provincial health insurance plans	Provincial Fee schedules
	- medico-legal liability	Provincial health regulatory bodies	Health Discipline Acts
	- competitive rates based on access and usage	CRTC and Provincial Boards of Utility	Same as #1
	- confidentiality	Code of Ethics, Health Discipline Acts	Health Discipline Acts
	- physician licensure	Provincial health regulatory bodies	
5. Cable T.V.	- permission of advertising revenue	CRTC	Broadcasting Act
	- cable companies tariff on pay services	CRTC	Broadcasting Act
	- limited channel capacity of cable services	CRTC	Broadcasting Act

These recent decisions reflect a pro-competition orientation, resulting in a much larger choice of equipment and services to Canadian consumers. The liberalization of terminal attachment policy should increase competition and open up new market opportunities for middle-sized as well as smaller, innovative Canadian firms. This increased competition, as well as opening up new opportunities for domestic producers, will also make the Canadian market more accessible to imports and foreign based multi-nationals.

### 7.3 Regulatory and Other Barriers to Telehealth

The regulatory and other barriers which were identified for telehealth applications were quite different for each of the four system concepts we identified. The major issues are summarized in Exhibit 15 opposite.

#### 7.3.1 Data Networks

Data networks represent the convergence of telecommunications, computer, and cable television technologies and it is, as yet, not clear which direction the current information revolution is going to take. The major regulatory dispute centres on who will provide "value-added" or "enhanced" services. Both these terms are not yet defined in Canadian regulations but as defined by the FCC in the U.S. they refer to services offered over common carrier transmission facilities which employ computer processing applications that act on the format, content, code, protocol, or similar aspects of the subscriber's transmitted information; provide the subscriber additional, different or restructured information, or involve

subscriber interaction with stored information. They would therefore include many of the services recommended in our first system concept based on data networks. Relevant CRTC rulings in Canada include:

- a nine-month trial in 1981 by Bell of a "Voice Message Service" marketed under the name "Call-Relay";
- the provision in 1981 of news reports to CNCP's Telex subscribers via a CNCP computer;
- the introduction by members of Telecom Canada in 1981 of a test-based messaging service marketed under the name Envoy 100;
- the approval in 1983 for CNCP to provide Electronic Mail and Office Communication Services (EMOC);
- the market trial of iNet2000 in 1983 by Bell Canada. This service would provide access to on-line data bases as well as message store and forward capabilities.

The CRTC is expected to hold hearings on enhanced services in the next year.

Other non-regulatory issues include the question of who will provide the databases and whether Canadians should even develop their own databases or simply tap into those already developed for the American market.

If Canadian databases are to be developed, the relatively small size of the Canadian market dictates the need for fewer better funded databases rather than the proliferation of independent databases we found in our survey.

#### 7.4 Regional Networks

Major barriers to the introduction of regional networks relate to need to have these networks developed in response to user demand rather than supplier push. The need for users to understand the technology and its capabilities and then to reach agreement on

their needs and the best way to meet these needs requires a central coordinating agency to educate, assess needs, and plan for delivery service. This is a difficult and time consuming process.

Regional networks also have the potential for altering roles of health care providers and disturbing conventional referral patterns. For example in the Sioux Lookout patients may be assessed in consultation by physicians at Sunnybrook Hospital in Toronto but, if necessary, they are evacuated to hospitals in Winnipeg. Such arrangements can discourage support by physicians in Toronto.

Another issue which arises was the confidentiality of satellite transmissions particularly if they include psychiatric consultations. We believe that current scramblers are available to ensure confidentiality.

A final issue relates to adjusting the reimbursement of physicians to recognize the time involved in providing remote consultation services. For example, most radiologists are accustomed to reading a chest x-ray in less than a minute. If such an x-ray is received via slow-scan then the radiologist would not be reimbursed adequately for the 15 to 30 minutes required for the interpretation. In Ontario, the O.M.A. and the government have begun discussions relevant to this issue.

Medico-legal liability was considered a potential barrier; however, no precedents have yet occurred in Canada which would clarify the law in this regard. Provincial governments could act proactively to define the law as it relates to remote consultation services.

#### 7.5 Audio Teleconferencing

The major barrier to the broader use of audio teleconferencing was the fact that, in some of the systems identified, the agenda for the teleconference was set centrally rather than in response to user defined needs. This has become less of a problem as each of the networks develops experience.

Various users also identified the need for special skills in concluding and chairing teleconferences. Again we believe these problems are minor and will be resolved as users gain experience with the new technology.

#### 7.6 Cable Television

The regulatory framework for the provision of specialty satellite programs are in a state of change in response to the government's request for proposals for the provision for specialty programming services on a discretionary user pay basis. The chief barriers as discussed under this system concept relate to the inability at present for these services to generate sufficient revenues without advertising revenues and some form of subscriber revenues collected by the cable distributors on a non-discretionary basis or through the provision of a tiered service. This issue will soon be re-examined by the CRTC.

## 8. RECOMMENDATIONS

In reviewing the proposed systems concepts, a number of areas were identified where action could be taken to promote the effective use of telecommunications in the health care industry in Canada. These activities should ideally be a shared responsibility of governments (federal and provincial) and professional organizations (national and provincial) and focus on the three key requirements for improved co-ordination, education, and funding.

### 8.1 Co-ordination of Activities

If the volume of telehealth activity is to grow in Canada, a much greater degree of co-ordination at a national, provincial and regional level will be required. There is a need for a national task force, including membership from the national professional bodies such as the Canadian Hospital Association, the Canadian Medical Association and the Canadian Nurses Association. Other groups such as the Alliance for Continuing Medical Education should be represented on this national task force. The task force should act as an important agent for collecting and disseminating information, setting standards, assessing the requirements of their constituents and assigning priorities for future developments. This body should also be advisory to funding agencies and regulatory agencies as required.

In addition to the national task force, there is also a need for interprovincial groups in some areas of the country such as the Maritimes and the Prairies, where there may be opportunities for

the development of regional networks for health care delivery. Provinces such as Ontario have already made progress to co-ordination of intraprovincial networks through existing regional planning bodies such as District Health Councils.

A third area for co-ordination is between the various ministries of health, education and social services at both a federal and provincial level. A number of provinces have moved in the direction of establishing joint cabinet committees where these three areas of provincial responsibility overlap.

#### 8.2 Creation of National Databases

From our review of existing uses, we found a large number of independent centres developing their own drug and poison information services, as well as nutrition information services. We believe the interests of Canadians could best be served by developing single reliable reference databases for drug, poison and nutrition information. There are a number of other opportunities where a national database would be of significant benefit. These include a central database on disease prevalence to be monitored by the Laboratory Centre for Disease Control, which could not only monitor and provide surveillance of health diseases but also disseminate information related to outbreaks of disease. Similarly, the Bureau of Medical Devices could both receive information on medical device malfunction or withdrawal from the market, and could disseminate information such as the medical devices alerts. In an analogous situation, the Drugs Directorate could provide a drug quality assessment program for surveillance and drug information. These are



only a few select examples of the many opportunities for the creation of national health databases. The pooling of resources and information can only serve to strengthen these services and make them more generally available.

The national bodies identified earlier need to work together to create these databases, or to select the best of those available from other sources. Along these lines, the Canadian Hospital Association is evaluating poison information systems for sponsorship. We believe that this process should involve the other national bodies where appropriate. These databases would also be complementary to the telecommunication needs of these organizations.

### 8.3 National Standards for Telehealth

A third area where we believe action is required is in the standardization of technology employed in the delivery of telehealth services. The standardization required in each of the system concepts is somewhat different and would need to be addressed separately by the national task forces. In areas such as slow scan television broadcast and reception, it would be exceedingly useful if a national standard of protocol were developed so that a physician in Sioux Lookout could communicate not only with centres in Ontario, but also with Winnipeg or other regions as required. Similarly, in the development of national data networks, protocols for signing on to the network and the command language for accessing information might beneficially be standardized.

#### 8.4 Dissemination of Technology Information

Repeatedly in our interviews, we found that there is a need to make health care providers much more informed about what is available. A number of the national organizations such as the Canadian Hospital Association and the Canadian Medical Association are maintaining watching briefs on telehealth developments. The Telehealth Team of Health and Welfare Canada is another vehicle in collecting and providing information concerning telehealth. The newsletter, Connection, provided by the CHA needs to be further supported and given a broader distribution. Workshops and conferences, particularly those sponsored by provincial and federal governments, have been very useful vehicles in bringing participants together in this rapidly changing technology. A number of people interviewed also expressed the requirement for training media and technical skills in effectively using the new technology. Particular concerns were that television broadcasting was being inappropriately used and was characterized by the "talking head" syndrome. There are a number of agencies now that have been set up to provide effective technical support in telecommunications areas for health and other disciplines.

Finally, there appears to be a need for a simple handbook for prospective users of telehealth to appreciate the technology, learn how to assess their needs and evaluate options available to them. Examples of handbooks for audio teleconferencing were found, but these need to be broadened to include the other systems concepts identified.

A somewhat different publication would be a telehealth handbook which summarizes, for each type of application, the history, the current status of technology, and current application developments across Canada with a regular (monthly or quarterly) update program analagous to the Canadian Telecom Alert published by the Canadian Industrial Communications Assembly. Such a handbook would be a very useful source of reference information for practitioners in the field. The Departments of Health and Welfare and Communications could sponsor the development of such a handbook.

#### 8.5 Funding

The overriding consideration of most of the people interviewed was the need for ongoing subsidies to the telehealth market. At the federal government level, opportunities for seed funding for developmental efforts are available through the unsolicited proposals grant fund, operated through the Department of Supply and Services, where the Department of Communications or the Department of Health and Welfare have traditionally sponsored projects of less than \$100,000 and less than one year for activities which do not fall within their regular budget submission. Similarly, the Department of Communications has provided substantial seed funding for the development of Telidon data bases through the Telidon Exploitation Program. Opportunities exist within the Department of Health & Welfare, Health Protection Branch, to provide databases and data networking facilities for activities such as drug, poison, nutrition, infectious diseases and medical devices information. The Medical Services Branch of Health and Welfare also provides direct services to

Northern Indians and others, it should also consider trials of establishing regional networks for health care delivery. The Department could also consider funding a demonstration project to determine the feasibility and cost effectiveness of a national data network including hospitals, nursing stations, regional test centres and physicians' offices.

Until recently, the professionals involved in telehealth experiments have contributed substantial amounts of their own time without reimbursement to these projects. If they are to be successful on an ongoing basis, changes to the provincial health insurance plan to recognize the services provided by remote consultation will be required. In Ontario, the Ontario Medical Association and the Ministry of Health have established a joint committee to review physician reimbursement. Similar committees will be required across Canada. One of the central problems of telehealth is that the people providing the health care component of telehealth services such as nurses and doctors, do not have a financial benefit in using this technology. If provincial governments, which are vested with the responsibility of providing equal access to health care services, believe that this technology offers a viable means for providing equitable and universal access to health care services, then they will need to provide both seed and ongoing funding support for these systems in the future.

A third potential source of funding for telehealth applications will be from the private sector by way of advertising revenues. Consideration needs to be given to the provision of

advertising services on specialty cable television channels. The sponsorship of various clinical databases such as a drug information service by Canadian pharmaceutical companies may also be considered.

#### 8.6 Regulatory Review

There are three areas where regulatory review is appropriate. In the first instance, long distance rates were felt to be prohibitive for health care facilities in remote and rural areas. Telecommunications is a sine qua non of health care in rural and northern Canada and it is imperative that accessible, reliable and affordable telephone services be provided to these health care providers either through land-line or satellite services. Despite the fact that satellite telephone links are, by their nature, relatively distance insensitive, in fact, the rates charged for toll calls vary substantially with distance. This is the result of the historical basis of determination of telephone toll charges. Because of the extensive degree of cross-subsidization of telephone rates in Canada, this is an extremely complex topic and is beyond the scope of this study.

The second area where regulatory review is required is in the area of broadband channel costs. Currently, a prospective user must buy a dedicated channel on a scheduled basis. The experience with telehealth demonstrates that users require intermittent and unscheduled access to telehealth equipment. It would be much more cost effective to have broadband costs related to actual usage of the channel and the amount of band width required rather than absorbing the full cost of a dedicated channel. Various sharing arrangements are currently being considered.

The third area for regulatory review is the provision for value added services by companies such as Bell Canada. From a purely telehealth perspective, it would be extremely convenient if companies such as CNCP or Bell Canada were permitted to provide on a commercial basis, electronic mail services such as Envoy 100 and database access services such as iNet in order to simplify the administration of these features nationally. This clearly has important ramifications for the full telecommunications industry; however, it is important that the needs of the health care industry be represented in these discussions.

APPENDIX 1

	<u>1. Health Education</u>			<u>2. Health Care Delivery</u>			<u>3. Administration</u>	<u>4. Social</u>
<u>Markets</u>	<u>1.1 General</u>	<u>1.2 Preparatory</u>	<u>1.3 Continuing</u>	<u>2.1 Consultation</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information Services</u>		
<u>A. Consumer</u> - General - Networks	Preventive - diet, lifestyle Public Health Pre & Post natal Disease specific - diabetes, cancer, heart - disabled First aid, poison		As in 1.1				Recruiting members Advocacy Consumer polls Ombudsman	Patient communication with family members
<u>B. Institutions</u> - Hospital - Nursing homes - Rehabilitation centres - Mental retardation facilities - Visual or hearing impaired - Correctional institutions - Day Hospital - Home Care	Preventive - diet, lifestyle Public Health Pre & Post natal Disease specific - diabetes, cancer, heart - disabled First aid, poison		In-service education staff (nursing, lab) Interhospital teleconference Teaching rounds Pharmacy bulletins Occupational health Laboratory technicians			Metro Organ Retrieval and Exchange	Inter Institutional transfer arrangements Shares Services	
<u>C. Government</u> - Federal - Provincial	Health Benefits Resources					Military	Statistics Financial Legislation and Announcements Emergency Services Statistics Canada	
<u>D. Professionals</u> - Doctors (GP, FP, Specialists) - Nurses (RN, RMA, Specialty) - Other Health Prof. - Physio - Speech - Occupational - Technicians - Veterinarians		Professional undergraduate education	Rounds Journal Clubs Topic specific programs Abstracts	Remote Consultation	Pacemaker Ambulance ECG EEG Diagnostic imaging Speech	Drug Information Services Poison Control Disease incidence	Business or Committee meetings Billing claims submission Job Search	Professional communication with peers or family
<u>E. Associations</u> - National - Provincial - Regional			Association sponsored courses to members				- Management and Planning information - Computer services to member institutions - Conference organization and arrangements - Labour arbitration rulings and salary settlements - Surveys of member institutions	
<u>F. Private Sector</u> - Drug Companies - Hospital Supply Distributors - Medical Equipment Suppliers			New Product Announcements Drug Information ("The Medical Letter") Druggists Therapeutics Medical Services			Compendium of Pharmaceutical Specialties	Hospital Supplies Price Information	



## 1.1/A Health Education - General/Consumer

### Needs

- o Preventive - diet, lifestyle, accident preventions, stress
- o Public Health
- o Pre and Post Natal courses
- o Disease specific programs - diabetes, arthritis, etc.
- o First Aid/Poison Control
- o Crisis Information

### Consumers

- o General public
- o People with specific health conditions, e.g. arthritis
- o Local networks for specific handicaps or conditions -  
Alcoholics Anonymous, C.P.A.

### Providers

- o Institutions, professional organizations, companies
- o Public health departments
- o Societies or organizations, e.g. Canadian Cancer Society

### Market Size and Geography

- o National - Urban - 25 million
- o Stratified
- o Specific rural populations - native peoples

### Current Delivery

- o Commercial television, written word/books and magazines,  
multi-media advertising
- o Educational television
- o Informal meetings and presentations

### Alternative Delivery

- o Telidon
- o Cable network
- o Videodisc, VCR
- o Electronic mail

### Likely Future Delivery Method

- o Cable TV - e.g. Canadian Health Network
- o Telidon - e.g. Nutrition Information Services

1.1/B General Health Education - Institutions

Needs

- o Preventive
- o Disease specific
- o Patient education

Consumers

- o Health care facility patients/residents and workers in
  - hospitals
  - nursing homes
  - rehabilitation centres
  - mental retardation facilities
  - home care
  - day hospitals e.g. diabetic training

Providers

- o Institutions, companies

Market Size and Geography

- o National - Regionalized

Current Delivery

- o Doctor to patient, nurse to patient
- o Movies, classes, videotapes
- o Pamphlets, displays, etc.

Alternate Delivery

- o Cable T.V. in facility
- o Videotape to institution or satellite distribution
- o Computer "programmed learning"

Likely Future Delivery Method

- o Videotapes to hospitals for internal rebroadcast

1.2/D Preparatory Health Education/Professional

Needs

- o Professional Education Programs

Consumers

- o Doctors, Nurses, Paramedical, Technical

Providers

- o Health Science Centres

Market Size and Geography

- o National - Provincial Boundaries

Current Delivery

- o Classroom (traditional)
- o Movies, videotapes, audio digest

Alternative Delivery

- o Video conferencing, Cable T.V.
- o Correspondence courses
- o Computer based interactive "programmed learning"
- o Data networks for supervision of practicum training

Likely Future Delivery Method

- o Not available in Canada for health professionals

### 1.3/D Continuing Health Education/Professional

#### Needs

- o Clinical updates
- o Self-evaluation programs
- o Occupational health information
- o Disease/drug/treatment information
- o Quality Assurance reviews
- o Training on new technologies, new procedures

#### Consumers

- o Doctors (GP, FP, Specialist)
- o Nurses (RN, RNA, Specialist)
- o Other health professionals (pharmacists, physiotherapists, etc.)
- o Technicians

#### Providers

- o Health Science Centres
- o Teaching Hospitals
- o Professional Organizations
- o Companies

#### Market Size and Geography

- o National with provincial and regional boundaries
- o Urban and rural
- o 36,000 Drs
- o 200,000 RNs
- o 12,000 Dentists
- o Pharmacists, radiology and laboratory technicians

#### Current Delivery

- o Bulletins
- o Conferences/conventions (including local meetings)
- o Mass media
- o Grand rounds and clinics pathological conferences

#### Alternative Delivery

- o Telidon
- o Electronic mail (display phone, computer terminal)
- o Audio and video conferencing
- o Cable T.V.
- o Computer terminal access to databases

#### Likely Future Delivery Method

- o 2 way audio with one way video - slow scan T.V.
  - full motion T.V.
  - predistributed visual aids
  - electronic blackboard
- o Data Networks (Telidon, Electronic Mail)

1.3/F Continuing Health Education/Private Sector

Needs

- o New product announcements/promotion
  - Medical/Dental/Nursing devices
  - Drugs
  - Other products
- o Product warnings/recalls

Consumers

- o Health Professionals

Providers

- o Manufacturer
- o Product Suppliers and distributors
- o Drug companies

Market Size and Geography

- o National
- o Urban
- o 36,000 Drs
- o 200,000 Rns
- o 12,000 Dentists
- o Pharmacists, Laboratory Technicians
- o Purchasing Agents

Current Delivery

- o Professional journals
- o New product announcements - mailings
- o Drug company representatives
- o Conferences

Alternative Delivery

- o Telidon
- o Cable T.V.
- o Audit/video conferencing
- o Data Networks
- o Electronic Mail

Likely Future Delivery Method

- o Cable T.V.
- o Data Networks (Telidon, Electronic Mail)

## 2.1/A Health Care Delivery - Consultation/Consumer

### Needs

- o Focussed information on Drug/Disease/Treatment/Resources
- o Consumer queries and provides notification

### Consumers

- o Patients/Residents and Families

### Providers

- o Public, University Libraries
- o Civic centres, shopping centres

### Market Size and Geography

- o National

### Current Delivery

- o Telephone
- o Library
- o Mail

### Alternative Delivery

- o Telidon in hospitals or library accessible to patients/clients
- o Computer information database
- o Cable

### Cost Benefit Analysis

### Likely Future Delivery Method

- o Library
- o Information Service, e.g. GTE Telenet
- o Data Networks, e.g. Telidon, Grassroots

2,1/D Health Care Delivery - \*Consultation/Professionals

Needs

- o Paramedic/Physician
- o Physician/Specialist
- o Specialist/Specialist
- o Protocols for treatment or investigation
- o Laboratory or Radiology technician to physician
- o Visiting nurse

Consumers

- o Paramedics
- o Doctors
- o Nurses
- o Dentists
- o Laboratory technicians, etc.
- o Physiotherapists

Providers

- o Regional Hospitals
- o Institutions
- o Health Science Centres
- o Provincial laboratory services

Market Size and Geography

- o National - Regional boundaries
- o Rural to regional to urban

Current Delivery

- o Radio
- o Telephone/radio
- o Travelling Clinics
- o Patient Referral

Alternative Delivery

- o Telephone
- o Radio
- o Audio teleconference+/video - S.S.T.V.  
- full notion T.V.
- o Local area network

Likely Future Delivery Method

- o Telephone
- o Audio teleconference + S.S.T.V.
- o Local area network among hospitals
- o Data network for protocols

\* Consultation may include elements of supervision (eg. paramedic/physician)

2.2/B Health Care Delivery - Diagnosis/Institutions

Needs

- o Pacemaker monitoring and maintenance
- o Special disease information (Herpes, etc.)

Consumers

- o General public

Providers

- o Institutions
- o Centre for disease control

Market Size and Geography

- o National - Regionalized - 25 million

Current Delivery

- o Telephone
- o Face to face
- o mail

Alternative Delivery

- o Remote sensing
- o Data networks



## 2.2/D Health Care Delivery - Diagnosis/Professionals

### Needs

- o Central interpretation of tests done in local setting
  - ECG
  - EEG
  - Pacemaker
  - Speech
  - Radiology and other diagnostic images
  - Pathology slides

### Consumers

- o Doctors
- o Nurses
- o Ambulance attendants
- o Allied Health Professionals
- o Technicians

### Providers

- o Institutions + Professionals

### Market Size and Geography

- o National - Regionalized
- o Rural to regional hospital to central facility

### Current Delivery

- o Travel, Mail
- o Audio and S.S.T.V.

### Alternative Delivery

- o Dial-up telephone
- o Digital data networks

### Likely Future Delivery Method

- o Dial-up telephone
- o Audio and S.S.T.V.
- o Digital data networks

2.3/B Health Care Delivery - Other/Institution

Needs

- o Vital organ transplant matching information
- o Blood transfusion service

Consumers

- o Institutions, Physicians

Providers

- o Institutions, Physicians

Market Size and Geography

- o International - Nationalized

Current Delivery

- o Telephone
- o Computer database

Alternate Delivery

Likely Future Delivery Method

- o Telephone/telex
- o Data network

## 2.3/D Information Databases/Professional

### Needs

- o Drug Information Service
- o Poison Control Centre

### Consumers

- o Doctors
- o Nurses
- o Pharmacists

### Providers

- o Institutions
- o Companies
- o Poison Control Centre
- o Drug Information Service to Hospital Pharmacists
- o Pharmacists hospital to community

### Market Size and Geography

- o National
- o Urban and rural

### Current Delivery

- o Microfiche
- o Hospital and drug information service bulletins
- o Telephone
- o Reference Manuals (compendium of Pharmaceutical Specialties)
- o Detail men-drug company representatives

### Alternative Delivery

- o Electronic mail
- o Videotext
- o Data Network

### Likely Future Delivery Method

- o Electronic mail
- o Videotext

3/B Administration/Institutions

Needs

- o General operating information
- o Multi-unit management
- o Support of central computer service bureau
- o Shares services - purchasing, food service

Consumers

- o Institutions

Providers

- o Government
- o Organizations (HMRI, HIS, PAS)
- o Associations
- o Institution groups (eg. Hospital Purchasing Inc.)

Market Size and Geography

- o National - Provincial Boundaries
- o 1,367 hospitals and other treatment centres

Current Delivery

- o Written media (mail)
- o Telephone

Alternative Delivery

- o Data Networks

Likely Future Delivery Method

- o Computer data network

### 3/C Administration/Government

#### Needs

- o Operating Statistics
- o Financial information from government institutions, mental health, public health
- o Legislation
- o Labour issues and settlements
- o Emergency services
- o Support of central computer service bureau
- o Billing claims submission and fee payments

#### Consumers

- o Provincial and Federal Governments

#### Providers

- o Institutions

#### Market Size and Geography

- o National - Provincial orientation
- o 1,400 institutions

#### Current Delivery

- o Written media - (mail)

#### Alternative Delivery

- o Electronic delivery - data base

#### Likely Future Delivery Method

- o Computer data network

### 3/D Administration/Professionals

#### Needs

- o Association information bulletins
- o Association meetings
- o Submission of billing claims forms and fee payment

#### Computers

- o Doctors
- o Dentists
- o Nurses
- o Other health care professionals

#### Providers

- o Professional Associations - Provincial and National
- o Provincial health insurance plans

#### Market Size and Geography

- o National - some provincial boundaries
- o Doctors - 36,000
- o Dentists - 12,000
- o Nurses, 200,000

#### Current Delivery

- o Written media - (mail)
- o Face to face

#### Alternative Delivery

- o Electronic delivery - data base (Telidon, electronic mail, data network)
- o Video/audio teleconferencing

#### Likely Future Delivery Method

- o Written media
- o Face-to-face
- o Telidon
- o Electronic mail
- o Data network
- o Two way audio + Point-to-multipoint video conferencing
  - S.S.T.V.
  - Full notion

### 3/E Administration/Associations

#### Needs

- o Association management - membership fees, insurance
- o Committee meetings
- o Operating statistics
- o Financial statistics

#### Consumers

- o Professional organizations

#### Providers

- o Member Institutions
- o Professionals

#### Market Size and Geography

- o National - with provincial boundaries

#### Current Delivery

- o Written media - (mail)
- o Face to face meeting
- o Telephone (conference calls)

#### Alternate Delivery

- o Electronic delivery - data base
- o Video/audio teleconferencing

#### Likely Future Delivery Method

- o Written media
- o Face-to-face
- o Telidon
- o Electronic mail
- o Data network
- o Two way audio + Point-to-multipoint video conferencing

3/F Administration/Private Sector

Needs

- o New product information
- o Purchasing and price information

Consumers

- o Institutions
- o Professionals

Providers

- o Private Sector
- o Group Purchasing Companies

Market Size and Geography

- o National - Regionalized
- o Urban

Current Delivery

- o Mail

Alternate Delivery

- o Electronic mail
- o Telidon
- o Information database

Cost Benefits Analysis

Likely Future Delivery Method

- o Interactive data network



4/A Social/Consumer

Needs

- o Patient communication with family members

Consumers

- o Patients

Providers

- o Hospital or institution

Market Size and Geography

- o Northern Canada
- o Paediatric patients

Current Delivery

- o Telephone
- o Travel

Alternative Delivery

- o Audio and video conferencing

Cost Benefit Analysis

Likely Future Delivery Method

- o Telephone
- o Audio + S.S.T.V.

Appendix 2

TECHNOLOGY: Data Network

	<u>1. HEALTH EDUCATION</u>		<u>2. HEALTH CARE DELIVERY</u>			<u>3. Administration</u>	<u>4. Social</u>
	<u>1.1 General</u>	<u>1.3 Continuing</u>	<u>2.1 Consulta- tion</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information Services</u>		
A. CONSUMER	X		X				
B. INSTITUTIONS						X	
C. GOVERNMENT						X	
D. PROFESSIONALS		X	X	X	X	X	X
E. ASSOCIATIONS					X	X	
F. PRIVATE SECTOR	X				X		

TECHNOLOGY: Telidon (Videotext, Teletext)

	<u>1. HEALTH EDUCATION</u>		<u>2. HEALTH CARE DELIVERY</u>			<u>3. Administration</u>	<u>4. Social</u>
	<u>1.1 General</u>	<u>1.3 Continuing</u>	<u>2.1 Consulta- tion</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information Services</u>		
A. CONSUMER	X						
B. INSTITUTIONS						X	
C. GOVERNMENT							
D. PROFESSIONALS		X			X	X	
E. ASSOCIATIONS						X	
F. PRIVATE SECTOR		X					

TECHNOLOGY: Cable T.V.

<u>1. HEALTH EDUCATION</u>		<u>2. HEALTH CARE DELIVERY</u>			<u>3. Administration</u>	<u>4. Social</u>
<u>1.1 General</u>	<u>1.3 Continuing</u>	<u>2.1 Consulta- tion</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information Services</u>		

A. CONSUMER

X

B. INSTITUTIONS

C. GOVERNMENT

D. PROFESSIONALS

X

E. ASSOCIATIONS

F. PRIVATE SECTOR

X

TECHNOLOGY: Audio Teleconferencing

	<u>1. HEALTH EDUCATION</u>		<u>2. HEALTH CARE DELIVERY</u>			<u>3. Administration</u>	<u>4. Social</u>
	<u>1.1 General</u>	<u>1.3 Continuing</u>	<u>2.1 Consulta-</u> <u>tion</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information</u> <u>Services</u>		
A. CONSUMER							X
B. INSTITUTIONS							
C. GOVERNMENT							
D. PROFESSIONALS		X	X		X	X	
E. ASSOCIATIONS						X	
F. PRIVATE SECTOR							

TECHNOLOGY: Teleconferencing with Augmentation

	<u>1. HEALTH EDUCATION</u>		<u>2. HEALTH CARE DELIVERY</u>			<u>3. Administration</u>	<u>4. Social</u>
	<u>1.1 General</u>	<u>1.3 Continuing</u>	<u>2.1 Consulta-</u> <u>tion</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information</u> <u>Services</u>		
A. CONSUMER							X
B. INSTITUTIONS							
C. GOVERNMENT							
D. PROFESSIONALS		X	X	X		X	
E. ASSOCIATIONS						X	
F. PRIVATE SECTOR							

TECHNOLOGY: Video Conferencing

	<u>1. HEALTH EDUCATION</u>		<u>2. HEALTH CARE DELIVERY</u>			<u>3. Administration</u>	<u>4. Social</u>
	<u>1.1 General</u>	<u>1.3 Continuing</u>	<u>2.1 Consulta- tion</u>	<u>2.2 Diagnosis</u>	<u>2.3 Information Services</u>		
A. CONSUMER							X
B. INSTITUTIONS							
C. GOVERNMENT							
D. PROFESSIONALS		X		X		X	
E. ASSOCIATIONS						X	
F. PRIVATE SECTOR						X	



QUEEN P 91 .C655 R52 1984 v.  
Richmond, Les  
Uses of telecommunications w



82452

--Uses of telecommunications within,,

P  
91  
C655  
R52e  
1984  
v.1

DATE DUE  
DATE DE RETOUR

13 DEC	1984
FEB 28	1985
APR 25	1985
MAY 24	1985
AUG 12	1986
FEB 17	1987
DEC - 8	1987
13 MAY	1988
13 MAY	1988
NOV 3	1989
APR 10	1996

LOWE-MARTIN No. 1137

