Department of Communications

USES OF TELECOMMUNICATIONS WITHIN THE HEALTH CARE SYSTEM

VOLUME 2: APPENDICES

A report from

Woods Gordon

Management Consultants

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APPENDIX A

DESCRIPTION OF THE HEALTH CARE SYSTEM IN CANADA

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INTRODUCTION

The purpose of this appendix is to present a general overview of the Canadian health care system, utilizing statistical information available in the published literature, to provide a background to our assessment of the potential for telehealth applications.

Health care in Canada is a large, complex system involving all levels of government, a variety of policy and funding approaches, a wide range of service delivery modes and professional disciplines, and every Canadian resident as a passive or active consumer of services. Obviously, a complete description of the system would be a major undertaking.

In this appendix, we have selected for discussion only those aspects of the health care system which have relevance for a telecommunications assessment. The next page presents a Table of Contents for this appendix, so that the reader can select those topics where further background information is required.

From a telehealth perspective, a summary of the most important implications of the health care system's structure has been included in the main body of this report.

Definition of Health Care System

To undertake our description, it was necessary to set some definitional boundaries on what is encompassed by the phrase "the health care system". We have not limited the scope to only the publicly insured health care services (primarily hospital and medical care), but have included other major programs provided by all or most of the provinces (e.g., public health), and also the activities of independent practitioners whose services are not normally covered by the provincial insurance plans (e.g., dentists and optometrists).

Although in the final analysis we conclude that many of these latter health care programs have negligible telehealth requirements, we believe it is important to provide a comprehensive description of the full spectrum of health care services, as an environmental context for our report's conclusions.

We have included all long term care facilities in our system definition whether provinces fund them through their health care or social services jurisdictions. However, we have excluded other programs traditionally viewed as social services such as children's mental health and programs for the developmentally disabled.

APPENDIX A

DESCRIPTION OF THE HEALTH CARE SYSTEM IN CANADA

TABLE OF CONTENTS

1. OVERALL ASSESSMENT OF THE CANADIAN HEALTH CARE SYSTEM

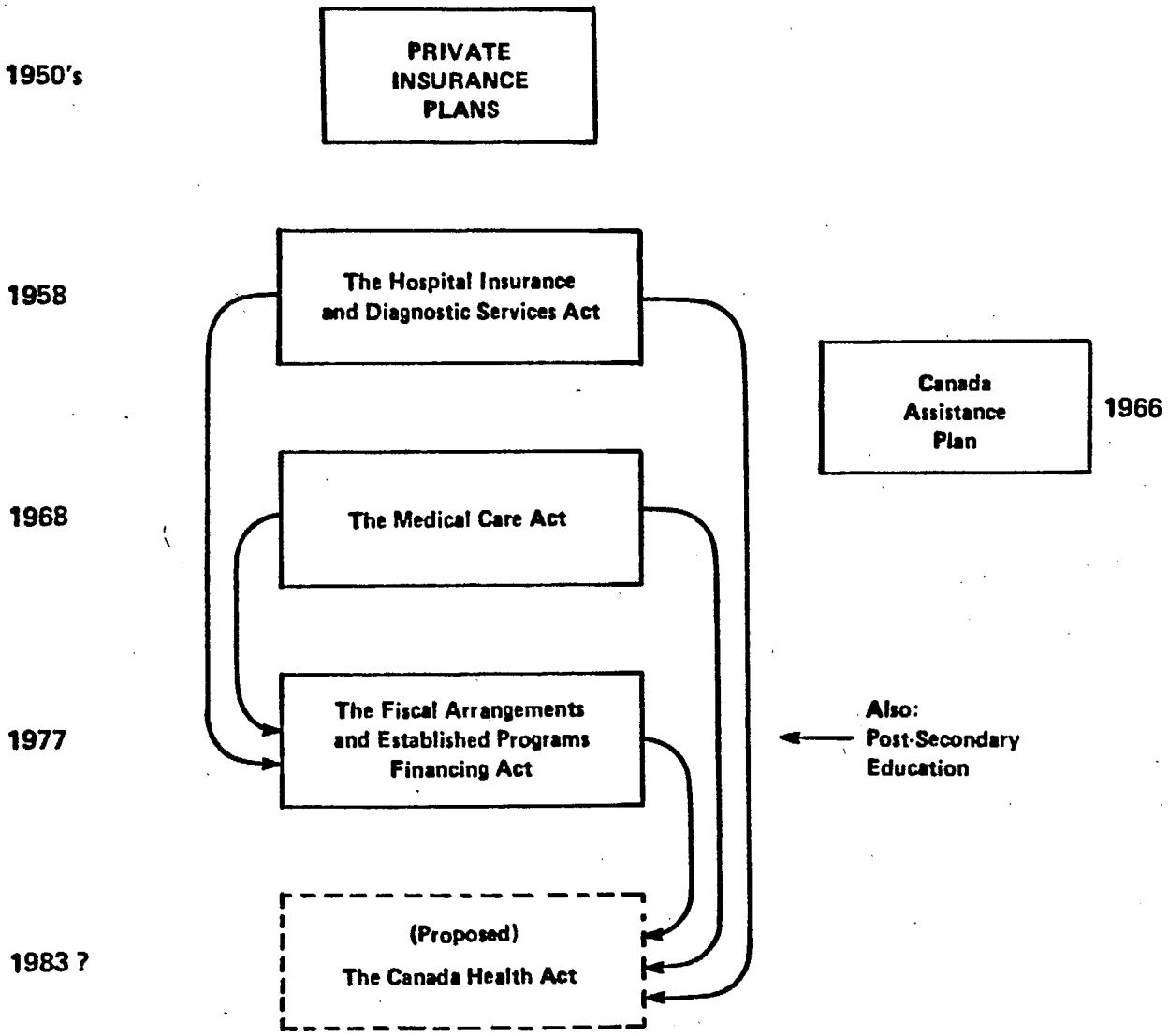
There is little debate that Canada has one of the most comprehensive, up-to-date and readily accessible health care systems in the world - and at a reasonable cost compared to expenditure levels for similar services in the United States.

In general, the Canadian health care system is well-endowed with facilities and equipment, despite the intimidating requirements resulting from the wide distribution of a relatively small population across a very large country.

The major area of regional disparity in health care resources is not in physical facilities but in the uneven distribution of health care manpower - particularly the medical specialties. Telehealth applications could play an important role in counter-balancing regional deficiencies in specialized knowledge.

Figure A-1

DEVELOPMENT OF CANADIAN HEALTH CARE INSURANCE LEGISLATION



2. NATIONAL LEGISLATIVE FRAMEWORK

Health care in Canada is a provincial responsibility, dating back to the British North America Act. Direct federal government involvement in service delivery is very limited. Indeed, even indirect federal involvement in the "mainline" health services is a relatively recent phenomenon.

Nevertheless, the fact that Canada has such an excellent health care system today is at least partially due to the federal government's initiatives in standardizing and expanding the provincial health insurance programs over the last 25 years. The most important legislation is shown in Figure A-1 opposite.

By the mid-1950's, most of the Canadian provinces had well-developed hospital and medical care systems, with a majority of their residents covered for these services by private health insurance plans. However, progress in developing health care facilities and health manpower had advanced much further in the "richer" provinces (e.g., Ontario) than some of the smaller provinces such as the Maritimes.

To achieve a consistent minimum standard of hospital and medical care across the country, the federal government initiated discussions with the provinces which resulted in the introduction of the national hospital insurance program in 1958 under The Hospital Insurance and Diagnostic Services Act. Five provinces immediately agreed to participate in the national program; the remaining provinces and territories joined by the end of 1960.

Introduction of the national medical insurance program under The Medical Care Act occurred in 1968, with only two provinces immediately participating but all of the provinces and territories joining the agreement by spring 1972. Although the ten provincial plans are not identical, they are similar to the extent that they must meet certain federal standards in order to quality for federal cost-sharing:

- portability across provinces
- reasonable access
- universal coverage
- comprehensive coverage
- reasonable compensation of providers
- uniform terms and conditions
- public administration on a non-profit basis

As a result of both provincial and federal dissatisfaction with these two federal health insurance acts, a new cost-sharing agreement was introduced in April 1977 under The Fiscal Arrangements and Established Programs Financing Act (commonly called "E.P.F."). Two major effects of the new E.P.F. arrangements were increased program flexibility and control for the provinces, and establishment of a ceiling on federal expenditures for hospital and medical care (and post-secondary education) related to growth in the gross national product and the population. Also, for the first time, the federal government included additional per capita payments for extended health care services (nursing home, health-related home care and ambulatory services) and all other adult residential care.

In the years since the introduction of the E.P.F. arrangements, the federal government has become concerned about increasing variation in the insured health care programs across Canada,

and about what it perceives to be a gradual undermining of the federal health insurance principles. Specific concerns relate to user charges and "extra-billing" by physicians in several of the provinces.

In order to alleviate these concerns, the federal government has announced that it intends to introduce in fall 1983 a draft of new umbrella legislation to cover the existing three acts. This new legislation, entitled The Canada Health Act, is expected to define the medicare principles in measurable terms, establish a monitoring process for ensuring that these standards are met in each province, and perhaps specify financial penalties for failure to meet the standards. The new Act also may include further expansion of the insured services definition to include, for example, mental health services. From a telehealth perspective, no direct implications of the proposed Canada Health Act are apparent at this time.

The provincial governments and medical associations are opposed to this proposed re-tightening of federal control under the Canada Health Act, as it would constrain the flow of private (consumer) funds into the system at a time when provincial deficits are a major problem across Canada.

In addition to the above four existing/proposed federal acts specifically focused on health care, there is a fifth federal act which covers a variety of social services related to health care. Federal-provincial cost sharing arrangements under The Canada Assistance Plan (1966) cover services such as children's mental health, programs

for the developmentally disabled, non-health home care, and a variety of non-insured health care services for clients eligible for social assistance.

The above five federal acts provide the basic framework for the Canadian health care system. (None of them mention telehealth.) Filling in this skeleton are a variety of provincial acts, and several additional federal acts related to specific health care services (e.g., control of food, drugs and hazardous products; health services for native, penitentiary and armed forces populations; quarantine; etc.).

3. CURRENT RESPONSIBILITY FOR HEALTH CARE SERVICES IN CANADA

Figure A-2 opposite illustrates the basic organization of the Canadian health care system. Figure A-3 provides recent federal and provincial health care expenditure figures, and Figure A-4 presents a breakdown of total Canadian expenditures by program.

Direct health care expenditures by the federal government ($1.2 billion in 1980) represent a very small proportion (7.8%) of total health care expenditures, but adding the federal government's cost-sharing contributions to the provinces increases the federal share of total costs to approximately 50%.

Looking at how these expenditures are distributed among the various health care programs (Figure A-4), 53% was spent on institutional care, 23% on professional services, and 11% on drugs and applicances. The major change in this expenditure pattern during the 1970's has been an increase in the proportion of resources allocated to institutional care.

How is responsibility for these major expenditures shared? Although the existence of national hospital and medical insurance legislation has achieved considerable program conformity across Canada, the provincial governments under The British North America Act still have primary jurisdiction over almost all health services. The federal government has responsibility only for very specific areas of service of national concern (e.g., health services for natives, penitentiary inmates, armed forces personnel and veterans).

Figure A-2

OVERALL STRUCTURE OF THE CANADIAN HEALTH CARE SYSTEM

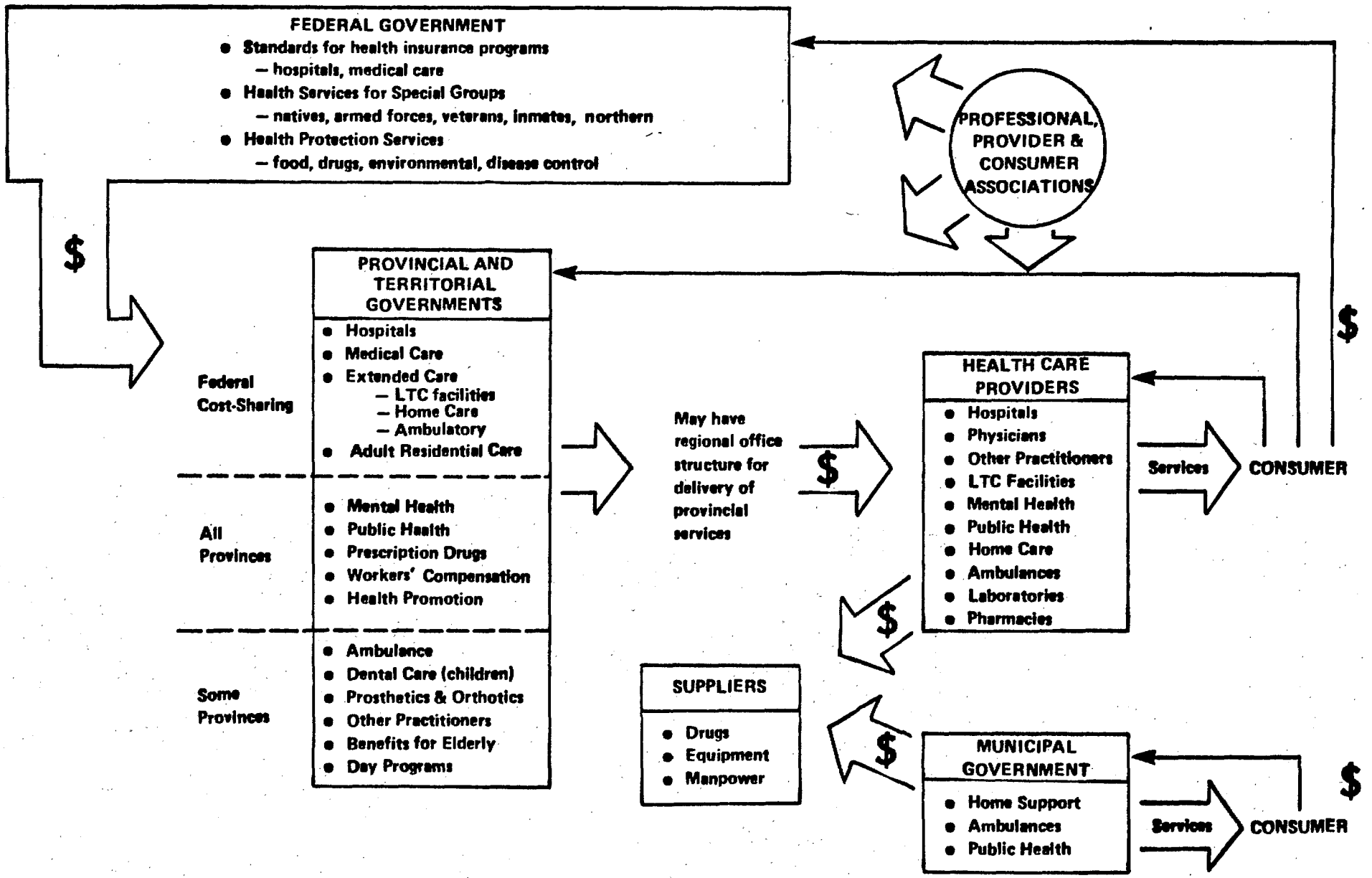


FIGURE A-3

TOTAL HEALTH EXPENDITURES BY
PROVINCIAL AND FEDERAL GOVERNMENTS, BY PROVINCE, 1979-80

(IN $ MILLION)

PROVINCE	(1) Total Provincial Expenditures[1]	(2) Federal Contributions[1]	(3) Federal Contributions as Percentage of Provincial Expenditures (2 as % of 1)	(4) Federal Health Expenditures[2]	(5) Total Federal Health Costs (2 + 4)	(6) Grand Total Expenditures[3] (1 + 4)
Newfoundland	297.8	152.1	51.1	15.8	167.9	313.6
Prince Edward Island	62.9	32.8	52.2	4.6	37.4	67.5
Nova Scotia	431.5	221.6	30.7	42.7	264.3	474.2
New Brunswick	363.6	183.4	50.4	25.4	208.8	389.0
Quebec	3,992.2	1,692.8	42.4	301.5	1,994.3	4,293.7
Ontario	4,705.6	2,211.2	47.0	367.7	2,578.9	5,073.3
Manitoba	577.2	269.5	40.7	57.8	327.3	904.5
Saskatchewan	558.9	248.8	44.5	33.6	282.4	592.5
Alberta	1,284.7	523.6	40.8	167.2	690.8	1,451.9
British Columbia	1,616.8	680.3	42.1	121.0	801.3	1,737.8
Northwest Territories Yukon				36.6		
CANADA $	13,897.2	6,216.1	44.7	1,173.9	7,390.0	15,071.1
%		41.2		7.8	49.0	100.0

1. E.H. Hall, Canada's National-Provincial Health Program for the 1980's, August 1980, page 17.

2. 1980 Calendar Year Federal Expenditures, Health and Welfare Canada, Planning Programming and Information Branch.

3. Excludes expenditures by local governments, private business and consumers.

FIGURE A-4

NATIONAL HEALTH EXPENDITURES BY PROGRAM,
CANADA, 1970 AND 1978

($ million)

	1970		1978	
	$	%	$	%
INSTITUTIONAL CARE	3,078.4	50.6	8,611.4	53.2
Hospitals	2,758.6		7,337.7	
General and allied special	2,251.7		6,642.1	
Mental	407.7		610.0	
Tuberculosis	23.7			
Federal	75.4		85.6	
Nursing homes	319.8		1,273.7	
PROFESSIONAL CARE	1,409.8	23.2	3,676.7	22.7
Physicians	1,040.7		2,539.1	
Dentists	265.0		918.1	
Other professions	104.1		219.5	
Chiropractors	34.2		93.5	
Osteopaths	1.9		2.0	
Optometrists	45.4		87.6	
Podiatrists	3.9		15.6	
VON	8.1		19.3	
Private duty nurses	10.6		1.5	
DRUGS AND APPLIANCES	779.4	12.8	1,821.6	11.3
Prescribed drugs	368.7		825.3	
Non-prescribed drugs	329.4		760.4	
Appliances	81.3		235.9	
Eyeglasses - Optometrists	27.1		52.6	
Eyeglasses - Opticians	31.5		120.3	
Hearing aids	9.7		20.4	
Other prostheses	13.0		42.6	
OTHER EXPENDITURES	819.1	13.4	2,071.8	12.8
Repayment and administration	97.7		242.0	
Public health	197.2		560.2	
Research	70.3		185.7	
Capital	365.4		826.7	
Other expenditures	88.5		257.2	
TOTAL EXPENDITURES	6,086.7	100.0	16,181.5	100.0

Source: Statistics Canada, Perspectives on Health, 1983, page 108.

Therefore, 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. Although provinces generally assign primary responsibility for health services to one of their departments, the distribution of functions varies from one province to another. Some provinces have combined health and social services within the same department; others maintain a liaison between two or more departments which share responsibility for these related services.

At the federal level, the Department of National Health and Welfare is the principal agency responsible for health matters.

3.1 HOSPITAL, MEDICAL, AND EXTENDED CARE SERVICES

Canada does not truly have a national health insurance plan. Rather, apparent country-wide insurance is achieved through a series of interlocking provincial and territorial hospital and medical care insurance plans which cover virtually all Canadians. Provided that they meet the federal criteria mentioned earlierin Section 2, the Provinces receive federal financial contributions for these insurance plans, made through a block fund financial transfer arrangement.

Since E.P.F., cost-sharing also is available for Extended Health Services - specifically nursing home and adult residential care, and the health components of home care and ambulatory services.

Nevertheless, establishment and funding of programs are entirely the responsibility of the provincial governments, which in turn

delegate responsibility for the provision of almost all services to the various health care providers - doctors, hospitals, public health units, etc.

3.2 FEDERAL HEALTH SERVICES FOR SPECIFIC GROUPS

The Department of National Health and Welfare provides (or arranges) health services for persons whose care by custom or legislation is a federal responsibility. Native peoples, as residents of a province or territory, are entitled to medical and hospital care under the provincial insurance plans. These insured benefits are supplemented by the Department in areas such as transportation and the purchase of drugs and prostheses.

With the exception of insured hospital and medical care programs administered by the governments of the Yukon and Northwest Territories, the Department manages health services for all residents of the two northern territories. The federal services include public health, transportation from isolated communities to medical centres, and special communications between facilities such as nursing/health stations, hospitals, and health centres.

The Department of Veterans Affairs (D.V.A.) is responsible for health services for war veterans. Under the Veterans' Treatment Regulations, veterans who qualify may receive a wide range of health care services: medical, surgical and dental treatment, prostheses, and long term care, which are provided at federal

institutions, contract hospitals, and through local community health facilities. In recent years, many of the federal D.V.A. hospitals have been transferred, through the provinces, to local hospital boards.

Figure A-20 (in section 6.2 below) indicates the approximate population of each of these special federal government client groups in each province.

3.3 FEDERAL HEALTH PROTECTION SERVICES

The health protection services of the Department of National Health and Welfare pertain to foods, drugs, environmental health, and disease control. In respect to nutrition, the Department determines, assesses and controls the nutritional quality of foods. The Department also studies causes of food poisoning, and recommends the microbial limits for foods.

The Department ensures the safety and efficacy of drugs in accordance with the Food and Drug Regulations by developing specific criteria and guidelines. Regulations also control the availability of drugs.

In the area of environmental health, the Department ensures that medical devices sold in Canada are safe and effective according to the Food and Drug Regulations. In respect to chemical hazards, the department is concerned with the health effects of chemical and microbiological agents in the environment. Control of environmental pollution is the responsibility of the Department of the Environment, shared with the provincial governments.

In the area of disease control, the Department monitors the morbidity and mortality from communicable and non-communicable diseases in the Canadian population.

3.4 ADDITIONAL PROVINCIAL PROGRAMS

Most provinces provide health services to supplement and complement those available through the provincial hospital and medical care plans. These vary from province to province. They may include mental health services; ambulance services; dental, optometric and other services from private practitioners; public health services; occupational, physical and speech therapies; prescription drugs; medical supplies and equipment; and other health related services.

These health services, together with the necessary social services, are delivered to persons needing them in their own homes, long-term care institutions, general hospitals, psychiatric hospitals, medical clinics, and health centres.

Programs which most provinces have developed in some form include the following:

- o Mental Health Services

  Many of these facilities are operated directly by the provinces and include community mental health clinics, psychiatric units in general hospitals, and psychiatric hospitals.

  Special rehabilitation services assist former psychiatric patients to function more adequately. These include sheltered workshops that provide work and training, halfway houses in which patients can live and continue receiving treatment while becoming settled in a job, and other programs.

- o Public Health Services

  Provincial health departments, in cooperation with regional and local health authorities, administer a number of services to protect health including environmental sanitation, control of communicable diseases, public health laboratories, and vital statistics. Public health bacteriology (testing of milk, water and food), diagnostic bacteriology, and pathology are the principal functions of the laboratory service.

- o Prescription Drug Services

  Prescription drugs are available to aged citizens and social assistance recipients at little or no cost in every province and territory. In a few provinces (e.g., Saskatchewan and Manitoba), the drug plan covers the entire population, usually with a deductible fee or co-payment.

- o Workers' Compensation Programs

  Each of the ten provinces has Workers' Compensation legislation, administered by a board or commission, which provides for compensation, medical care and rehabilitation for workers injured in industry or affected by occupational disease.

- o Health Promotion

  The provincial health departments promote improved lifestyles for Canadians, and encourage the development of community health programs. Major areas of health promotion involve the non-medical use of drugs, including alcohol and tobacco, nutrition education, and general approaches to improving lifestyles. Federal and provincial governments cooperate in selected national health promotion projects on alcohol, tobacco, and drug use among the elderly.

Some provinces have developed additional programs in the following areas:

- o Ambulance Services

  Provincial ambulance programs (with user charges) have been established in about half the provinces, with a few provinces (e.g., Manitoba and Ontario) operating special transportation programs for northern areas.

- o Prosthetic and Orthotic Services

  Prosthetic and orthotic services and personal aids are available through prosthetics service centres located in major cities, hospitals and rehabilitation centres, and from Workers'

Compensation Board Centres. Alberta, Saskatchewan, Manitoba and Quebec have comprehensive programs providing such services and Ontario has a similar program for children. Provincial home care programs are another source, as are some voluntary agencies, e.g., the Red Cross provides some items through its loan services.

- o Insured Benefits for Services Provided by Other Private Practitioners

  Some provinces have included under their medical insurance programs selected services rendered by practitioners other than physicians, e.g., optometrists, chiropractors, podiatrists, physiotherapists, etc.

- o Special Insured Benefits Programs for the Elderly

  A few provinces (e.g., Alberta) have introduced supplementary benefits under their medical insurance programs for senior citizens. These benefits may include both professional services, physical aids and appliances, and waiver of premiums and user charges.

- o Day Programs

  Several provinces have established a few day hospital or day care programs aimed at preventing or postponing institutional admission of the elderly or disabled.

- o Dental Care for Children

  A few provinces have introduced insured dental prevention and treatment programs for children (e.g., Saskatchewan, Quebec, Nova Scotia and Newfoundland).

3.5 LOCAL/MUNICIPAL RESPONSIBILITIES

In the past, municipal governments had major responsibility for funding and operating a variety of health programs including hospitals, long term care facilities and public health services. Today, however, almost all health programs are funded and controlled by the provincial governments (with federal cost-sharing), although local boards provide direct management.

Municipal funding responsibilities now are restricted primarily to non-health home care and ambulance services (in some provinces). Ontario is the only province where municipalities still contribute part of the funding for public health services.

3.6 REGIONAL RESPONSIBILITIES

Unlike the British model, control over the health care system has remained tightly centralized with the provincial governments, with little decentralization to regional bodies. Ontario has established district health councils with responsibility for area-wide planning and service coordination, but their authority is only advisory to the provincial health ministry.

Many of the provinces have a regional office structure under their health department, but these offices tend to focus on delivery of selected provincial services (e.g., outpatient mental health services in Alberta), rather than on regional planning or control of health care facilities and programs.

3.7 PROFESSIONAL/PROVIDER ASSOCIATIONS

Virtually all professional health disciplines have their own provincial and national membership associations which serve a wide range of functions (excluding direct patient care). For many of these associations, membership is voluntary. The functions served by the associations include fee/salary and other negotiations with provincial governments and employers; continuing education; development of the discipline's field of practice; and benefit and investment programs for the self-employed.

These associations have a very major role to play in ensuring an adequate flow of information within each profession, often through a network of provincial chapters (or affiliated associations) relating to a national body. The extent to which the national association has the mandate to represent the provincial associations on topical issues varies from one organization to another. Examples of these organizations are the Canadian Medical Association and the Ontario Physiotherapy Association.

In addition, each professional discipline has provincial and national regulatory bodies which serve the mandatory functions of licensing, standards and discipline. Examples of these bodies are the College of Family Physicians of Canada and the Ontario Board of Directors of Physiotherapy. In general, an individual health care worker must be separately licensed/registered to practice in each province.

Health care facilities and programs have similar voluntary-membership provincial and national associations to represent their interests and to maintain standards. Examples of the first type are the Canadian Hospital Association and the Alberta Public Health Association. Examples of the second type are the Canadian Council on Hospital Accreditation and the Ontario Council on Community Health Accreditation.

Increasingly these professional/provider associations are developing new roles in data collection, communications, and group purchasing, which have major relevance for this study of telehealth needs and resources.

3.8 SUPPLIERS

The health care system is supported by a wide range of private sector and non-profit suppliers of drugs, equipment, manpower and management services. Besides the private sector firms, suppliers include agencies like the Victorian Order of Nurses and the Canadian Red Cross.

Normally these suppliers would not be considered as having responsibility for the health care system, except where they may be on contract to the government to provide a specific service - for example, home care programs operated by the V.O.N., or hospitals and long term care facilities operated by the Red Cross or a private firm.

3.9 CONSUMER ASSOCIATIONS

Consumers, usually representing many specific disease or disability groups, have formed their own local, provincial and/or national associations to undertake a wide variety of functions - lobbying of governments, research, services to patients and families, and education. Examples are the Canadian Cancer Society and the British Columbia Association for the Mentally Retarded.

These consumer associations also would not be considered as having responsibility for the health care system, except where they may be on contract to the government to provide a specific service - for example, the operation of sheltered workshops or provision of home support services for the physically disabled.

4. DEGREE OF INDEPENDENCE OF HEALTH CARE PROVIDERS

Although the provinces have primary authority and funding responsibility for health care services (with federal cost-sharing of hospitals, medical care and extended care programs), they have delegated responsibility for the actual establishment and provision of almost all services to the various health care providers. Individual facilities, programs and private practitioners have considerable independence in what services they provide, and how they provide them.

In reality, therefore, the provincial governments have very limited powers to eliminate or reduce specific health care services that are already in place. For example, the elimination of unnecessary duplication of a specific service in a community (e.g., obstetrics) occurs only through the joint agreement of the hospitals concerned - it is not ordered by the provincial government.

Governments do have somewhat greater control over the introduction of new programs, as this normally requires an increase in provincial funding. However, even in this area, individual hospitals or programs may finance a new program through other means (e.g., a group of doctors may purchase the necessary equipment for the hospital), thereby avoiding the need for provincial approval.

It therefore would be very inaccurate to view the health care system as twelve monolithic provincial/territorial structures, where rationalization of services can be mandated from the top. Virtually all changes must receive voluntary agreement from the health care providers involved.

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Even in the area of funding, where the provinces do have full authority, a few health care programs are "open-ended" - increases in service volumes are translated automatically into increases in total costs (e.g., physician services). Indeed, even in the programs covered by annual budgets (e.g., hospitals), the governments have found it very difficult to refuse appeals for supplementary funding to cover budgetary deficits.

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The following provides a brief comment on the relationship of provincial governments to the major categories of service providers.

4.1 HOSPITALS

Most Canadian hospitals are funded under a global budgeting system. This allows them considerable flexibility in their service portfolio and delivery methods, as long as they remain within budget. However, prior provincial approval normally is required for major renovation/construction projects, purchase of high-cost technology (e.g., CT scanners), and introduction of new or expanded programs, including additional inpatient beds. In Ontario, approval by the local District Health Council also is required.

As a rule, hospitals have not been able to retain any budgetary surpluses, and provinces usually have provided supplementary funding to cover any year-end budgetary deficits. However, in the last year, provincial governments have been moving towards a position of refusing to finance future deficits, but allowing hospitals to retain any surpluses. This change in budget approach is most advanced in

Ontario, but appears to be spreading to other provinces. Besides controlling provincial liabilities, it allows hospitals greater flexibility in spending, as long as the new expenditures can be covered by their generated surplus funds. However, major expenditures and program changes still require prior provincial approval.

4.2 OTHER HEALTH PROGRAMS

Most other health programs (e.g., psychiatric hospitals and public health units) also are funded on a global budget basis, although there is no evidence as yet of any move towards allowing them to retain any budgetary surpluses. Some programs still are funded on a line-by-line basis (e.g., home care programs in Ontario).

As long as programs operate within their global budget, they often exercise considerable independence in services provided and delivery methods.

4.3 PRIVATELY PRACTISING PRACTITIONERS

The provinces control the volume and/or cost of private practitioner services through four means:

- limits on the number of practitioners participating in the medical insurance plan, implemented through post-secondary education quotas (physicians) and licensing (private physiotherapists);
- exclusion of particular services from the insured benefits package (e.g., cosmetic surgery);
- exclusion of certain types of practitioners from the plan (dentists) or limits on the volume of insured service per patient (chiropractors);
- annual negotiation of the fee-for-service reimbursement rates.

Within these broad provincial government controls, and the practice standards set by their own professional groups, individual practitioners are free to practise as they choose - and considerable variation in practice does occur.

The preeminent practitioner group, physicians, not only controls its own practice, but also largely determines the utilization of hospitals, private laboratories, home care programs, etc.

Several practitioner groups are not covered by the medical insurance plans, although this varies from province to province. The services of these professional groups (such as dentists, optometrists, podiatrists, chiropractors and psychologists) may be partially covered by private insurance plans. However, normal market demand and supply factors have a substantial affect on their activity and price levels.

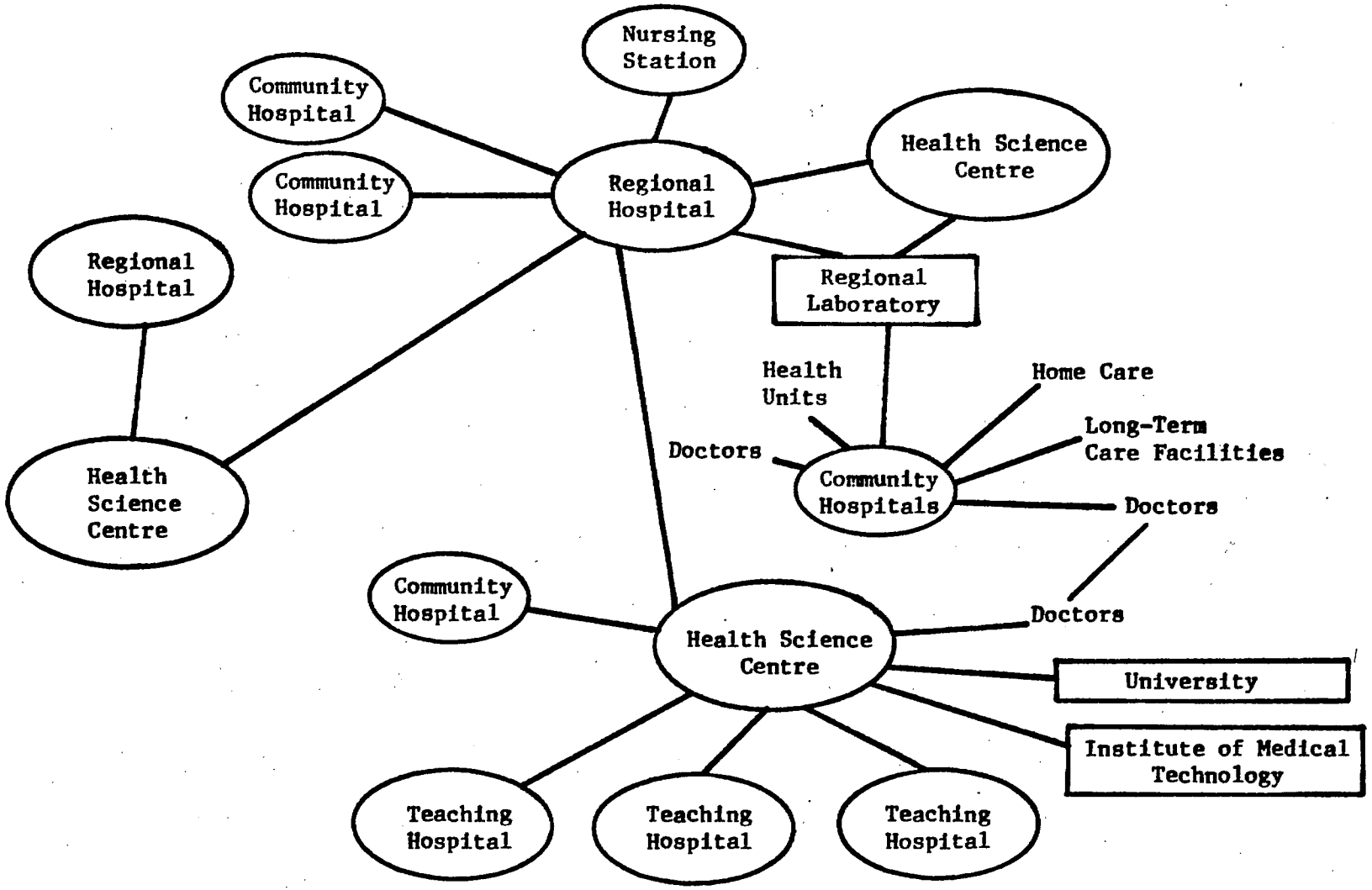
4.4 INTRA-PROVINCIAL CARE HIERARCHIES

Despite the substantial independence of individual doctors and hospitals, there are well-established "care hierarchies" within each province that shape resource distribution and scope of individual practices.

Figure A-5 opposite illustrates a typical care hierarchy, centred on a health sciences centre (i.e., a medical school centre) and extending out into the hinterland to tie small community hospitals and individual doctors into a network of patient referral and information exchange.

FIGURE A-5

NETWORK OF HEALTH CARE FACILITIES



Usually these hierarchies have evolved naturally over the years as specialized resources have tended to grow and concentrate in research and teaching centres. In some provinces where the natural evolution has been delayed by poorer economic climates (e.g., some of the Atlantic provinces), provincial governments have taken a stronger leadership role in recent years in promoting development of these regional care networks.

In general, the most specialized, scarce and often expensive resources are concentrated in the centre of the hierarchy at the health sciences centres. This is the "hub" where new technology (both equipment and techniques) is first introduced into the province.

Gradually professional skills and public expectations increase in the communities outside the hub, and the technology becomes diffused outward. The extent of diffusion of an individual technology depends on the need/demand volume and the costs of duplicating the technology in several centres. Some technologies are rapidly diffused (e.g., ultra-sound) while others remain more concentrated (CT scanners, therapeutic radiology).

Two basic commodities flow through each care hierarchy: patients and information. Patients are referred from the periphery towards the hub, the extent of the referral depending on the referring doctors' perceptions of their patients' need for specialized attention. Conversely, specialized information flows out from the hub to health care providers (and consumers) on the periphery. This information may be patient-specific, or it may be of a more general educational nature,

e.g., the development of family doctor's skills to monitor the progress of cancer patients on established treatment protocols.

The patient and information flows may be formal (e.g., in some provinces cancer patients must be referred to cancer treatment centres) or informal (e.g., a specialist doing a monthly consultant clinic in a community hospital may spend time discussing new surgical techniques with the hospital's medical staff).

In several provinces, the provincial governments have used the naturally-evolved care hierarchies as mechanisms for introducing new health care delivery concepts (e.g., regionalized trauma care), or for controlling the diffusion of high technology (e.g., tying acquisition of expensive diagnostic equipment to catchment population thresholds). These hierarchies also can be used as a network-base for the introduction of telehealth systems.

5. CONSUMER MARKET CHARACTERISTICS IN HEALTH CARE

One of the basic tenets of the Canadian health care system is that the consumer is free to choose his/her health care practitioner(s) - doctor, dentist, optometrist, chiropractor, etc. - with this decision being very influenced by travelling time.

Similarly, individual practitioners are free to choose where and how they will practise their profession, with this decision influenced by market factors such as population size, number of similar practitioners already present in the area, and his/her ability to obtain hospital privileges (i.e., authority to admit and treat patients within a particular hospital).

In summary, provincial governments do not control where consumers will seek care or where providers will choose to practise.

Under the Canadian medicare principle of portability, a Canadian resident has insured coverage for hospital and medical care in any Canadian province. Through inter-provincial reciprocal agreements, the provinces reimburse each other (at standard/provincial rates) for care provided to other provinces' residents. However, the patient receiving out-of-province care may have to pay the additional user charges applicable in that province (e.g., Alberta's charge of $20 for each day in an active treatment hospital), or a portion of the full cost if the service is not an emergency. Nevertheless, these costs represent a very small proportion of the total service cost.

Health care providers cannot move freely across Canada to practise their profession, but must be appropriately licensed/registered in each province in which they wish to practise. For many disciplines

(e.g., physicians) this is mainly a formality, as inter-provincial differences in professional training standards usually are minor. Physicians tend to establish their practise in the provinces (and cities) where they completed their training, resulting in much higher concentrations of physicians in cities with medical schools than might be warranted by the catchment population size (e.g., Kingston).

In summary, there are very few barriers to movement of either consumers or providers in the Canadian health care system, with propinquity having a major influence on market patterns.

5.1 Health Care Market Demand Factors

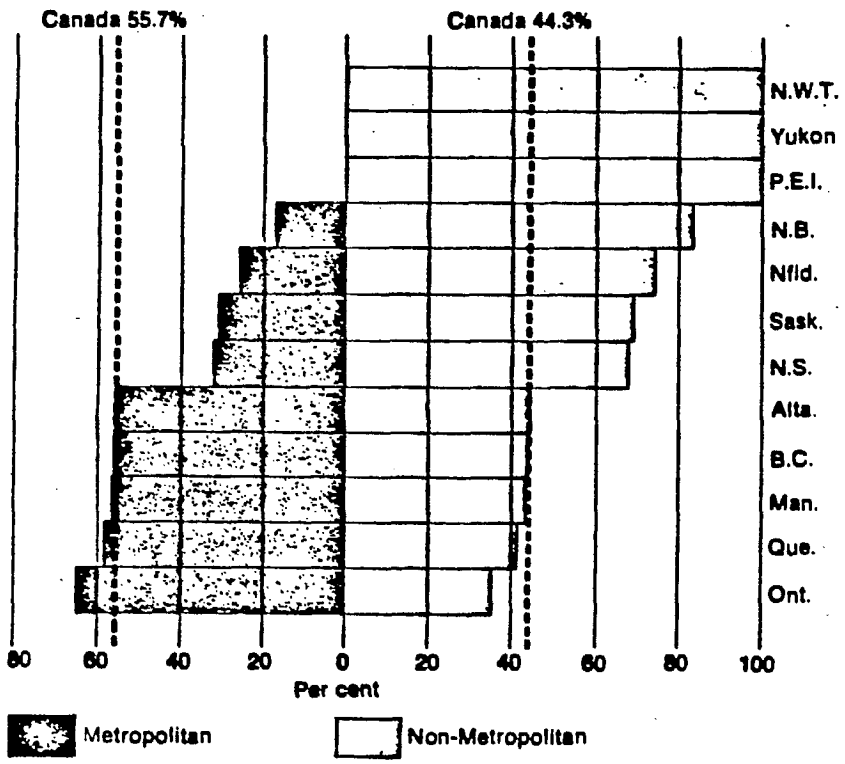
Health care consumers (i.e., the total population) are very unevenly distributed across Canada, with 63% of the Canadian population living in Ontario and Quebec, and 43% living in just the nine largest metropolitan areas.

The degree of concentration of the population in large urbanized areas (Census Metropolitan Areas) varies among the provinces from 66% in Ontario to 0% in P.E.I. (see Figure A-6). The degree of concentration influences the per capita costs of providing health care services, due to economy of scale factors. Figure A-7 illustrates the uneven distribution of population in Census Metropolitan Areas across the country.

The demand for health care services is dependent on a complex interaction of need and supply factors. Need for health care services is believed to vary by age, sex, ethnicity, occupation, residence and income. However, the exact differentials are difficult to

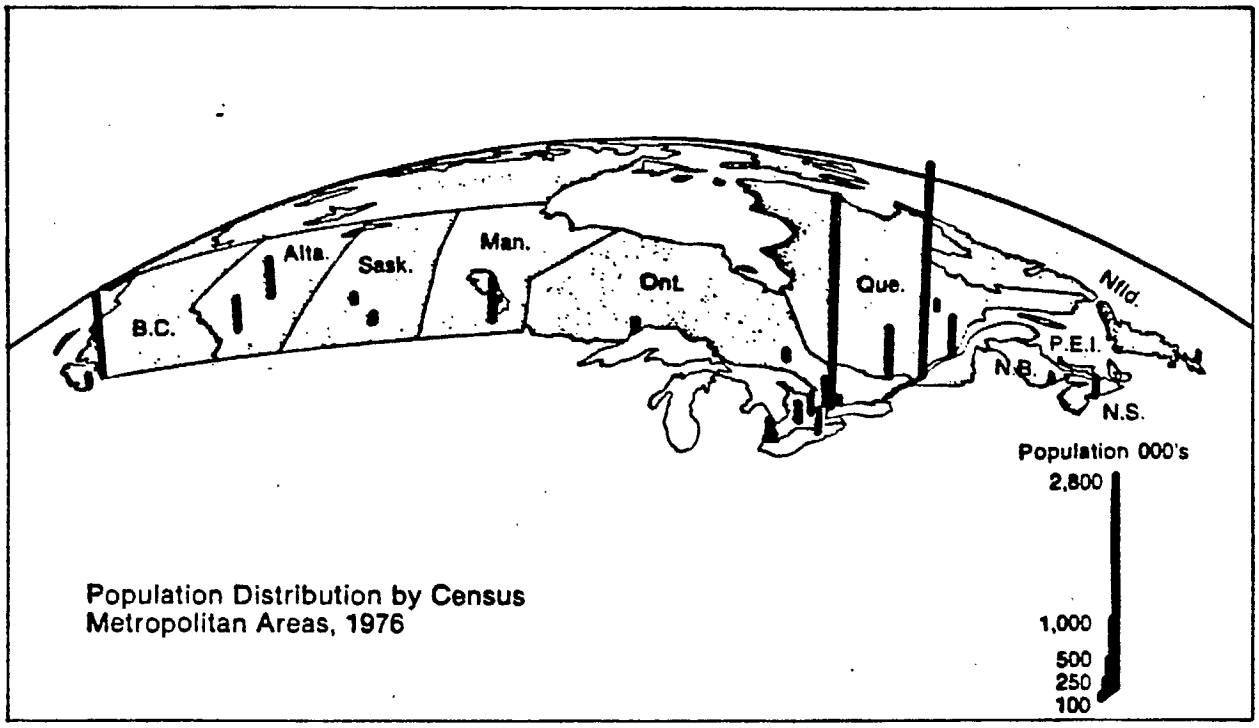
FIGURE A-6

Proportion of Metropolitan and Non-metropolitan Population by Province, 1976



Source: 1976 Census of Canada, Catalogue 92-806, Table 6.

Figure A-7



Population Distribution by Census Metropolitan Areas, 1976

Source: 1976 Census of Canada, Catalogue 92-806, Table 6.
Adapted from Perspective Canada III, Catalogue 11-511, 1980.
Produced by the Geocartographics Centre, 1979.

determine as the translation of need into demand for health care services is greatly influenced by the relative supply of health care resources (e.g., institutional beds and physicians), and consumer awareness and expectation levels. For example, high-income consumers make heavier demands on the system, even though their superior housing and nutritional standards should act to lower their need for health care services.

As a general rule, if institutional beds are available, they will be filled with patients; this applies both to acute care hospitals and long term care facilities (e.g., nursing homes and mental hospitals). Also, areas with a relatively high supply of physicians will exhibit higher per capita physician utilization rates.

5.2 NEED FACTORS

One need factor that varies substantially across Canada and has a definite impact on the demand for services is the age structure of the population. As shown in Figure A-8, some provinces have a substantially larger proportion of their population aged 65 years of age or older. The importance of this phenomenon is revealed in the following:

> The elderly make up only 10 per cent of the population (in Ontario) but they absorb 35 per cent of the total health care dollar.
>
> Breaking down these figures, the elderly account for:
>
> - 19% of OHIP (medicare) payments;
> - 38% of days of inpatient general hospital care;
> - 79% of days of inpatient chronic hospital care; and
> - 93% of extended care in nursing homes.
>
> (Source: 1982/83 Estimates, Province of Ontario - presentation by the Hon. L. Grossman, Minister of Health to the Committee on Social Development, November 1982).

FIGURE A-8

PERCENTAGE DISTRIBUTION OF THE POPULATION BY BROAD AGE GROUPS, CANADA AND PROVINCES, 1976

Age Group	CANADA	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Yuk. & N.W.T.
0-14	25.6	33.7	28.1	27.0	28.5	24.9	25.1	26.0	26.9	27.4	24.1	35.3
14-44	46.5	44.6	43.0	44.6	44.9	48.5	46.2	43.9	41.8	47.8	46.0	50.3
45-64	19.1	15.1	17.7	18.6	17.6	18.9	19.8	19.7	20.2	17.3	20.0	11.5
65+	8.7	6.6	11.2	9.7	9.0	7.7	8.9	10.4	11.1	7.5	9.8	2.7
Total:												
Per Cent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number ('000)	22,993	558	118	829	677	6,234	8,264	1,022	921	1,838	2,467	64

Source: W.E. Kalbach and W.W. McVey, The Demographic Bases of Canadian Society, Second Edition, 1979, page 170.

FIGURE A-9

SEX RATIOS BY REGIONS FOR CANADA, 1976

Region	Sex Ratio*
Atlantic	101.0
Quebec	97.9
Ontario	98.3
Prairies	101.6
British Columbia	112.7
Territories	112.7
CANADA	99.2

*Number of males for every 100 females

Source: as above, page 159.

Variation in the sex composition also has an impact on the demand, as female utilization of health care services is higher than males - particularly during the child-bearing years. Figure A-9 presents regional variations in sex ratio across Canada.

5.3 SUPPLY FACTORS

The supply of health care resources varies quite dramatically among the provinces. Variation in the two most important resource areas, institutional beds and physicians, is shown in Figures A-10 and A-11.

Canada as a whole tends to have an "institutional approach" to providing care (14.5 beds per 1,000 population) compared to the United States and Europe, but the Western provinces and Prince Edward Island have a particularly high concentration of beds.

Looking at the distribution of physicians across Canada (Figure A-11), British Columbia, Ontario and Quebec have the greatest total supply of physicians. This uneven distribution is more evident with medical specialists than with general and family physicians, although British Columbia and Ontario have a relatively greater supply of both types than the other provinces.

5.4 RESULTANT DEMAND VARIATION

The interplay of provincial variations in need and supply factors produces substantial variation in health care utilization rates across Canada. One summary indicator of utilization differences is per capita health care expenditures in each province (Figure A-12), although

FIGURE A-10

SUPPLY OF INSTITUTIONAL BEDS[1]
PER THOUSAND POPULATION, BY PROVINCE, 1978

Province	Acute Care Beds[2]	Rehabilitation & Convalescent Beds	Chronic Care Beds[3]	Psychiatric Beds[4]	Long Term Care Beds[5]	TOTAL BEDS
Newfoundland	5.1	0.1	0.4	0.7	4.1	10.4
Prince Edward Island	5.2	0.3	0.2	0.5	11.4	17.5
Nova Scotia	6.1	0.1	0.2	0.7	8.8	15.8
New Brunswick	5.3	0.1	0.4	1.6	5.8	12.4
Quebec	3.7	0.2	2.2	1.4	4.9	12.4
Ontario	4.2	0.2	1.0	0.9	8.2	14.5
Manitoba	5.3	0.2	1.1	1.1	8.6	16.3
Saskatchewan	6.5	0.1	1.3	0.7	9.6	18.1
Alberta	6.0	0.2	1.6	0.8	-[6]	-[6]
British Columbia	4.3	0.3	2.2	1.6	9.1	17.6
Yukon Territory	7.1	0	0.2	0	4.5	11.7
Northwest Territories	8.8	0	1.0	0	1.4	11.1
CANADA	4.5	0.2	1.5	1.1	7.3	14.5

1. Includes federal hospitals.
2. Excludes psychiatric units in general hospitals.
3. Includes a large number of "converted mental hospital beds".
4. Includes psychiatric units in general hospitals, but excludes all beds for the mentally retarded.
5. Includes beds in nursing homes, homes for the aged, facilities for the mentally retarded, and an "other" category. Excludes beds in hostels, homes for child protection, and homes for unwed mothers.
6. Missing in report.

Source: E.H. Hall, Canada's National - Provincial Health Program for the 1980's, August 1980, page 54-59.

FIGURE A-11

POPULATION PER ACTIVE CIVILIAN PHYSICIAN BY PROVINCE, DECEMBER 31, 1978

PROVINCE	POPULATION PER ACTIVE CIVILIAN PHYSICIAN							
	General and Family Practitioners		Specialists		All Physicians Excluding Interns and Residents		All Physicians Including Interns and Residents	
		Rank		Rank		Indices (Canada=100)		Indices (Canada=100)
Newfoundland	1,377	8	2,502	10	888	133.33	708	126.65
Prince Edward Island	1,344	7	2,352	9	855	128.38	832	148.84
Nova Scotia	1,206	3	1,523	5	673	101.05	549	98.21
New Brunswick	1,748	12	2,132	8	960	144.14	890	159.21
Quebec	1,522	11	1,138	1	651	97.75	542	96.96
Ontario	1,250	5	1,328	3	644	96.70	529	94.63
Manitoba	1,310	6	1,409	4	679	101.95	559	100.00
Saskatchewan	1,248	4	2,131	7	787	118.17	678	121.29
Alberta	1,417	9	1,622	6	756	113.51	627	112.16
British Columbia	1,071	2	1,261	2	579	86.94	528	94.45
Yukon	948	1	4,360	12	779	116.97	779	139.36
Northwest Territories	1,437	10	3,918	11	1,051	157.81	1,051	188.01
CANADA	1,317	-	1,347	-	666	100.00	559	100.00

Source: E.H. Hall, Canada's National-Provincial Health Program for the 1980's, August 1980, pg. 37.

FIGURE A-12

PER CAPITA HEALTH EXPENDITURES
BY PROVINCIAL GOVERNMENTS,
BY PROVINCE, 1979-80

PROVINCE	PER CAPITA HEALTH EXPENDITURES ($)	Rank	INDICES (CANADA = 100)
Newfoundland	518.82	7	88.18
Prince Edward Island	511.38	10	86.92
Nova Scotia	515.92	9	87.69
New Brunswick	518.69	8	88.16
Quebec	633.28	2	107.63
Ontario	553.14	6	94.01
Manitoba	559.84	5	95.15
Saskatchewan	584.62	4	99.36
Alberta	640.11	1	108.79
British Columbia	629.35	3	106.97
Northwest Territories			
Yukon			
CANADA	588.37		100.00

Source: E.H. Hall, Canada's National-Provincial Health Program for the 1980's, August 1980, pages 19-20.

this indicator is affected by other important factors such as economies of scale (for large, dense population concentrations), and the track record of the individual provincial governments in constraining increases in expenditure levels.

Utilization rates for individual programs vary substantially across the provinces as shown in Figures A-13 and A-14. Quebec has high utilization rates in most programs, but the other provinces tend to be high in some areas and low in others.

In summary, these differences in demand for health care services cannot be explained by variations in need alone, but must be perceived as partially a response to varying supplies of physicians and other health care resources.

FIGURE A-13

SELECTED UTILIZATION RATES, BY PROVINCE, 1977-78

	General Hospitals		Mental Institutions[1]		Hospital Ambulatory Care	
	Days per Capita	Rank	Days per Capita	Rank	Visits per Capita	Rank
Newfoundland	1.39	10	1.62	10	0.97	2
Prince Edward Island	1.71	8	2.42	2	0.07	11
Nova Scotia	1.61	9	1.91	9	0.19	6
New Brunswick	1.80	5	2.28	5	0.08	10
Quebec	2.33	1	2.40	3	1.12	1
Ontario	1.73	7	1.99	8	0.28	4
Manitoba	1.75	6	2.08	7	0.25	5
Saskatchewan	2.24	2	2.37	4	0.12	8
Alberta	2.01	4	2.22	6	0.16	7
British Columbia	2.17	3	2.47	1	0.11	9
Northwest Territories	0.45	11	0.45	11	0.76	3
Yukon	N/A	-	N/A	-	N/A	-
CANADA	1.97	-	2.19	-	0.48	-

1. Includes days in mental institutions plus psychiatric units in general hospitals.

Source: Statistics Canada, Perspectives on Health, 1983, pgs. 89-91

FIGURE A-14

PHYSICIAN SERVICES RATES, BY REGION
1978-79

TYPE OF SERVICE	REGION			CANADA
	WESTERN	CENTRAL	ATLANTIC	
	Services per 1,000 Population			
Office visits	3,738	4,257	3,621	4,056
Hospital visits	937	888	923	905
Home visits	236	154	351	194
Consultations	270	290	243	280
Major surgery	63	69	66	67
Minor surgery	81	114	74	101

Source: Statistics Canada, Perspectives on Health, 1983, page 92.

6. TYPOLOGY AND DISTRIBUTION OF POTENTIAL TELEHEALTH USERS IN THE HEALTH CARE SYSTEM

The nature of future demand for telecommunications in any industry is greatly influenced by the type, number and distribution of the people who will use it as a tool to do their jobs. From this perspective, the health care system is characterized by a wide geographic distribution of a large number of health care providers, divided into several professional groups, working in a variety of settings (see Figure A-15 opposite).

6.1 HEALTH CARE DISCIPLINES

Figure A-16 presents the approximate number of health care workers in each of several major discipline groups, by province. This listing excludes the many "assistant" workers and also workers who are employed in a variety of settings other than health care (e.g., secretaries, computer specialists, housekeepers, etc.).

Although there is a large number of separately identifiable health disciplines, a relatively small proportion of these disciplines represent independent practitioners, and only some of these independent professionals provide care under the medical insurance plans (e.g., physicians, dental surgeons and in some provinces physiotherapists, optometrists, chiropractors, etc.).

It is the independent practitioners, particularly physicians, who make the major patient care decisions - often ordering the services of other disciplines or the allocation of drugs, supplies and equipment. This control over the micro-allocation of health care

FIGURE A-15

DISTRIBUTION OF HEALTH DISCIPLINES BY WORK SETTING

HEALTH CARE SETTINGS	SELECTED HEALTH DISCIPLINES									
	Physicians	Nurses	Rehab Therapists	Lab Techs	Pharmacists	Psychologists	Health Educators	Environmental Inspectors	Dentists	Optometrists Podiatrists Chiropractors
INPATIENT FACILITIES:										
Hospitals	X	X	X	X	X				X	
Nursing Stations		X								
Long Term Care	X	X	X							
Mental Hospitals	X	X	X		X	X				
OFFICES:										
Medical clinics/offices	X	X								
Comm. Health Centres	X	X	X				X			X
Other Practitioners		X				X			X	X
AGENCIES:										
Health Units	X	X					X	X	X	
Home Care		X	X							
SUPPLIERS:										
Pharmacies					X					
Laboratories	X	X		X						
ESTIMATE OF TOTAL MANPOWER (1981)	44,275	232,820	6,112	18,271	16,588				11,095	4,364

FIGURE A-16

DISTRIBUTION OF HEALTH CARE WORKERS BY DISCIPLINE AND PROVINCE

	INDEPENDENT PRACTITIONERS					SALARIED EMPLOYEES				
PROVINCE	Physicians[1]	Dentists[1]	Optometrists[1]	Chiropractors[1]	Podiatrists[1]	Nurses[1]	Occupational Therapists[1]	Lab. Technicians[1]	Physiotherapists[1]	Pharmacists[1]
Newfoundland	866	110	27	2	-	4,687	21	302	47	308
Prince Edward Island	152	40	6	3	-	1,074	8	84	21	54
Nova Scotia	1,588	309	45	18	1	7,755	30	869	173	554
New Brunswick	786	183	57	30	3	7,028	20	478	69	343
Quebec	12,160	2,469	743	504	120	54,941	255	3,205	438	3,357
Ontario	16,664	4,510	687	737	96	96,165	680	6,522	1,972	5,724
Manitoba	1,878	439	73	73	-	9,000	101	1,060	279	860
Saskatchewan	1,442	322	89	85	-	8,310	33	1,014	175	1,293
Alberta	3,406	1,027	185	265	13	18,892	137	2,194	562	2,080
British Columbia	5,265	1,658	185	270	39	24,675	154	2,496	926	1,986
Northwest Territories	40	16	5	-	-	293	-	47	11	9
Yukon Territory	28	12	2	1	-	-	-	-	-	20
CANADA	44,275	11,095	2,104	1,988	272	232,820	1,439	18,271	4,673	16,588
#/100,000 Population	182	46	9	8	1	956	6	75	19	68

1. Canada Health Manpower Inventory, 1981, Health and Welfare Canada, 1982.

resources has earned the medical profession the title of "gate-keepers of the system". Figure A-17 illustrates the relationship between the medical profession and other health disciplines.

Under special circumstances, some medical tasks have been delegated to other professionals, but this process has been quite limited in Canada to date. The primary examples of delegation are nurse-practitioner roles in remote nursing stations, expanded nursing roles in emergency departments and intensive care units of larger hospitals, and para-medical roles in emergency transportation systems. Greater use of physician-substitutes has occurred in the United States (e.g., physician extenders and assistants) and Britain (e.g., midwives), than in Canada.

Of the 44,000 Canadian physicians, approximately half are general or family practice physicians and half are specialists. Only in Quebec do specialists outnumber family physicians. In some provinces, such as Newfoundland and Prince Edward Island, only 35% of the doctors have specialty certification.

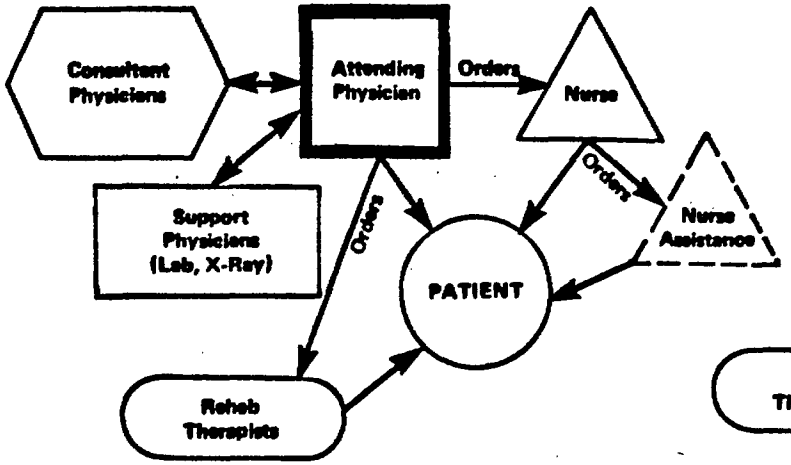
Figure A-18 presents medical manpower supply guidelines by specialty group. Compared to Canada's actual supply, we have a slight surplus of general/family practice physicians, an adequate supply of medical specialists, and shortages in some of the surgical and other specialties. However, Canada's physicians are not evenly distributed across the provinces as shown earlier in Figure A-10 and discussed in section 6.3.1 below.

Nurses represent approximately two-thirds of all health manpower in Canada, and work in virtually all health care settings, but

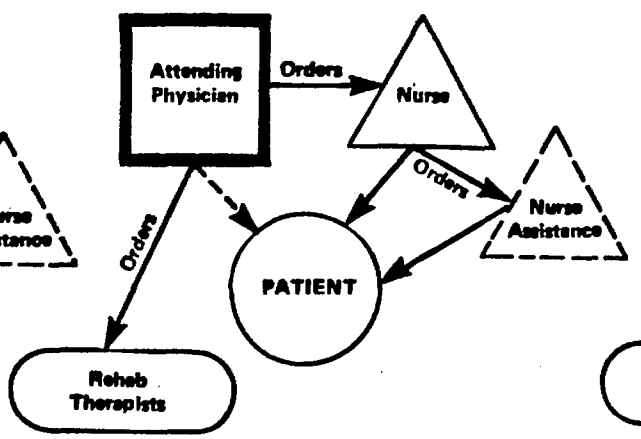
Figure A-17

RELATIONSHIPS AMONG HEALTH CARE DISCIPLINES

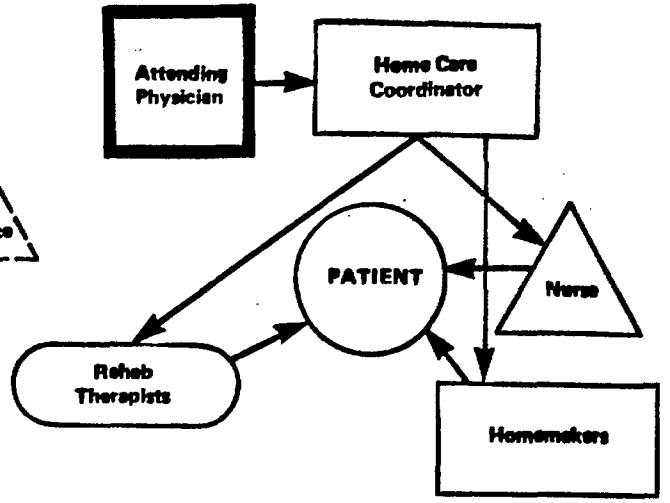
ACUTE CARE HOSPITALS



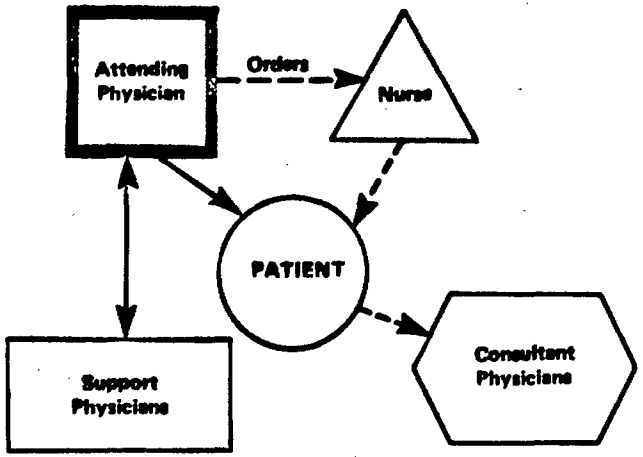
LONG TERM CARE FACILITIES



HOME CARE



MEDICAL CLINICS AND OFFICES



OFFICE OF OTHER INDEPENDENT PRACTITIONERS

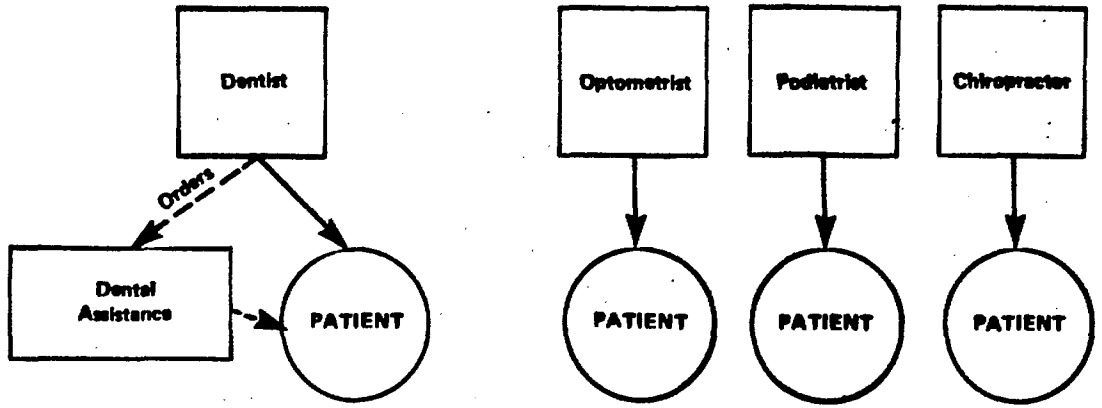


FIGURE A-18

CANADIAN MEDICAL MANPOWER SUPPLY GUIDELINES
(Physician : Population Ratios)

SPECIALTY	FEDERAL GUIDELINES[1]	ONTARIO GUIDELINES[2]
General Family Practice	1 : 2,300*	1 : 1,800**
Medical Specialties:		
Internal Medicine	1 : 8,200	1 : 6,707
Allergy and Clinical Immunology	1 : 100,000	-
Cardiology	(N/A)	-
Gastroenterology	1 : 100,000	-
Hematology	1 : 65,000	-
Respirology	1 : 78,600	-
Rheumatology	1 : 150,000	-
Dermatology	1 : 65,300	-
Neurology	1 : 90,000	-
Paediatrics	1 : 20,000	1 : 21,400
Physical Medicine and Rehabilitation	1 : 100,000	1 : 70,000
Psychiatry	1 : 11,000	1 : 9,550
Public Health	1 : 180,000	1 : 80,000
Surgical Specialties:		
General Surgery	1 : 11,000	1 : 13,000**
Cardio- and Thoracic Surgery	1 : 117,000	1 : 100,000
Neurosurgery	1 : 166,700	1 : 165,000
Obstetrics/Gynecology	1 : 17,500	1 : 16,500
Opthalmology	1 : 28,000	1 : 28,000
Otolaryngology	1 : 50,000	1 : 50,000
Orthopedic Surgery	1 : 30,400	1 : 30,000
Plastic Surgery	1 : 100,000	1 : 100,000
Urology	1 : 50,000	1 : 50,000
Other Specialties:		
Anaesthesia	1 : 13,742	1 : 13,100
Laboratory Medicine	-	1 : 25,000
Nuclear Medicine	1 : 250,000	-
Medical Biochemistry	1 : 204,000	-
Medical Microbiology	1 : 100,000	-
Pathology	1 : 16,100	-
Radiology	1 : 16,000	-
Radiology, Diagnostic	1 : 15,300	1 : 16,500
Radiation Oncology	1 : 154,000	1 : 160,000

* Full-time fee-for-service
** Full-time equivalents

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1. Report issued by requirements subcommittee of National Committee on Physician Manpower, Canadian Medical Association Journal, August 7, 1976, Vol. 115, No. 4.

2. Committee Report on Postgraduate Manpower, Council of Ontario Faculties of Medicine and Ministry of Health, 1975.

their decision-making power within the system is limited. Other health professionals, such as the various rehabilitation specialists, also provide care under orders from physicians.

Other than the independent practitioners, health care disciplines normally are salaried employees of a facility or program, and are not reimbursed on a fee-for-service basis.

The above structure of scope of practice limitations within the health care system strongly influences who would use telehealth applications, and for what purposes. Physicians as primary decision-makers in the system probably would be the key users of telehealth for direct patient care applications. However, telehealth also could be a particularly effective method for providing continuing education for the large number of other health professionals especially nurses. These systems also could reach out directly to consumers, providing both preventive and maintenance health education programs, without local professional involvement being required.

6.2 HEALTH CARE SETTINGS

Beyond possible telehealth applications to meet the needs of health professionals in patient care and continuing education, telehealth systems also can provide support for the administration of health care facilities and programs. Therefore, the number, type and distribution of health care settings is important not only in identifying where health professionals work, but also in determining the potential for administrative applications.

Figure A-19 identifies the approximate current number of health care settings, by major category, in each province. By far the largest number of settings is in the category of medical clinics/offices (15,700). However, the number of physicians per clinic/office is much lower than the average number in the 1,121 hospitals.

After medical clinics/offices and hospitals, the next most numerous health care setting categories are pharmacies and long term care facilities (e.g., nursing homes and residential care homes for the elderly).

Almost a half million Canadians work in the health care sector, with their distribution by major health care settings shown in Figure A-20. Again, the predominance of hospitals in the health care system is demonstrated, and also the predominance of female employees.

The distribution of federal government health care settings is shown in Figure A-21.

6.3 REGIONAL DISPARITIES IN HEALTH CARE RESOURCES

It is widely acknowledged that Canadian health care services are poorly distributed; i.e., they are more readily available in the large urban areas then elsewhere. Proposed solutions to this problem have included expanded roles for nurses, enhanced local facilities, incentives to attract necessary manpower (particularly physicians), improved transportation to larger centres and telecommunications linkages.

FIGURE A-19

DISTRIBUTION OF HEALTH CARE SETTINGS BY PROVINCE

PROVINCE	HEALTH CARE SETTING										
	INPATIENT FACILITIES				OFFICES		AGENCIES		SUPPLIERS		
	Hospitals[1]	Nursing[1] Stations	Long Term[4] Care	Mental[2] Hospitals	Medical Clinics, Offices	Comm. Health Centres	Health Units	Home Care	Pharmacies[3]	Labs (outside of hospitals) Provincial	Private
Newfoundland	38	9	98	1	190	15	5	4	128	1	-
Prince Edward Island	10	1	16	1	39	1	6	2	26	-	-
Nova Scotia	49	2	158	4	561	0	7	1	208	-	-
New Brunswick	33	1	170	2	480	15	21	4	138	-	-
Quebec	240	9	565	7	3145	107	0	0	1045	23*	18*
Ontario	255	14	1185	25	6605	27	43	38	1625	13	206
Manitoba	83	20	183	3	834	10	8	0	318	2	24
Saskatchewan	139	2	172	2	545	15	13	49	289	1	44
Alberta	149	5	179	3	905	0	27	0	543	2	14
British Columbia	116	20	487	8	2393	0	22	0	644	1	270
Northwest Territories	6	40	2	-	13	1	6	7	2	-	-
Yukon Territory	3	3	2	-	-	0	10	0	6	-	1
CANADA	1121	126	3217	56	15710	191	168	105	4972	20	558

* Estimates.

1. As of March 31, 1980, from Statistics Canada, Hospital Annual Statistics, 1979-80.
2. Canada Year Book, 1980-81.
3. Southam Direct Marketing Services, Mailing List for Canadian Pharmaceutical Association, 1982.
4. Directory of Long Term Care Centres in Canada, 1980.

FIGURE A-20

LABOR FORCE IN THE HEALTH SECTOR BY WORK SETTING, 1971

WORK SETTING	LABOUR FORCE #	LABOUR FORCE %	% FEMALE
Hospitals	354,130	78.8	77.2
Nursing homes	16,135	3.6	87.9
Physicians' offices	43,285	9.6	59.1
Dentists' offices	15,445	3.4	60.4
Paramedical personnel offices	7,825	1.7	60.8
Diagnostic and therapeutic services	6,565	1.3	75.7
Other	5,845	1.3	77.0
TOTAL	449,230	100.0	74.9

Source: L. Soderstrom, The Canadian Health System, 1978, page 69.

Note: Updated statistics from the 1981 Census should be available in late 1983.

FIGURE A-21

DISTRIBUTION OF FEDERAL GOVERNMENT
HEALTH CARE FACILITIES AND CLIENTS ACROSS CANADA

PROVINCE	FACILITIES[1]		CLIENTS			
	Hospitals	Nursing Stations	Native[2] Population	Armed[3] Forces	Veterans[4]	Territories[5] Residents
Newfoundland	-	-	-	869	5,850	N/A
Prince Edward Island	-	1	509	914	2,774	N/A
Nova Scotia	1	2	5,631	11,983	15,199	N/A
New Brunswick	-	1	5,249	4,532	10,289	N/A
Quebec	2	9	30,723	10,814	23,318	N/A
Ontario	3	14	67,460	23,911	64,898	N/A
Manitoba	3	20	44,642	4,287	10,804	N/A
Saskatchewan	1	2	46,275	1,562	7,594	N/A
Alberta	4	5	36,150	7,673	12,796	N/A
British Columbia	1	14	55,217	8,644)	29,737	N/A
Northwest Territories	3	40	7,725	241)		45,740
Yukon	3	3	3,268	0)		23,150
TOTAL	21	111	302,849	75,430	183,259	68,890

1. Hospital Annual Statistics, 1979-80, Statistics Canada, 1983.

2. Indian Health Services Information Book, Health and Welfare, 1980.

3. Canadian Armed Forces Monthly Personnel Statistics, December 31, 1982, Total Population on Armed Forces Bases, Department of National Defense, Ottawa

4. Department of Public Affairs Ottawa, Canada. Includes recipients of Veterans Allowances or Disability Pension. Figures have been adjusted to account for Veterans who receive both.

5. 1981 Census of Canada, Population, Age, Sex and Marital Status, Statistics Canada, 1982.

6.3.1 Manpower Deficiencies

The primary area of resource disparity is in medical manpower. Although Canada and most of the provinces have an adequate supply of physicians, there is considerable variation in supply within each province - particularly within individual specialties. Some communities have been unsuccessful in attracting any physicians, while other larger communities have one or more general practitioners but cannot attract specialists.

To illustrate the magnitude of variation in medical manpower supply, Figure A-22 shows the 1980 physician:population ratios for each county in Ontario. Looking at all physicians, the number of people per physician varies from 280 (for Kingston in Frontenac County) to 1575 (in Haldimand-Norfolk), with a provincial average of 547.

The non-specialist ratios vary from 631 to 1865, with a provincial average of 992; the specialist ratios from 504 to 23,171, with a provincial average of 1219. Specialists tend to be more concentrated in communities with medical schools. Gaps in specialist availability may indicate priority areas for telehealth application.

Some specialties are more deficient outside the large urban areas than others. In Ontario, psychiatrists and ophthalmologists are in particularly short supply.

In addition to variation in physician supply, there are major regional disparities in the distribution of other health care disciplines. Again looking at 1980 figures for Ontario, the number of

Figure A-22

Doctors, Specialists and Non-Specialists, by County, Ontario, 1980

	Non-Specialists		Specialists		Total Doctors	
	Total[1]	Population Ratio[2]	Total[1]	Population Ratio[2]	Total[1]	Population Ratio[2]
Ontario	8,636	992	7,027	1,219	15,663	547
Algoma	88	1,479	62	2,099	150	868
Brant	74	1,384	62	1,652	136	753
Bruce	41	1,436	8	7,358	49	1,201
Cochrane	75	1,260	22	4,297	97	974
Dufferin	25	1,220	3	10,166	28	1,069
R.M. of Durham	211	1,312	127	2,180	338	819
Elgin	52	1,336	31	2,241	83	837
Essex	219	1,446	180	1,759	399	794
Frontenac	183	831	229	504	412	280
Grey	65	1,124	48	1,522	113	647
Haldimand-Norfolk	49	1,865	9	10,152	58	1,575
Haliburton	10	1,114	–	–	10	1,114
Halton	244	1,016	183	1,355	427	581
Hastings	101	1,050	62	1,710	163	650
Huron	42	1,335	8	7,007	50	1,121
Kenora	36	1,611	8	7,250	44	1,318
Kent	83	1,285	38	2,806	121	881
Lambton	80	1,554	69	1,801	149	834
Lanark	55	823	9	5,032	64	708
Leeds & Grenville	73	1,111	39	2,080	112	724
Lennox & Addington	23	1,416	5	6,516	28	1,163
Manitoulin	13	854	1	11,105	14	793
Middlesex	501	950	485	671	986	330
Muskoka	43	888	14	2,728	57	669
R.M. of Niagara	266	1,382	198	1,857	464	792
Nipissing	68	1,182	37	2,172	105	765
Northumberland	53	1,225	12	5,411	65	999
Ottawa-Carleton	702	781	768	714	1,470	373
Oxford	68	1,245	28	3,022	96	861
Parry Sound	37	906	8	4,190	45	745
Peel	335	1,375	161	2,862	496	929
Perth	63	1,046	25	2,837	88	749
Peterborough	95	1,078	102	1,004	197	519
Prescott & Russell	41	1,279	6	8,742	47	1,116
Prince Edward	18	1,229	7	3,161	25	865
Rainy River	18	1,287	1	23,171	19	1,219
Renfrew	73	1,187	26	3,333	99	875
Simcoe	212	1,046	81	2,738	293	757
Stormont, Dundas & Glengarry	68	1,494	43	2,363	111	915
Sudbury	115	1,611	102	1,816	217	854
Thunder Bay	108	1,406	85	1,785	193	786
Timiskaming	38	1,081	8	5,136	46	894
Victoria	34	1,398	16	2,970	50	951
Waterloo	221	1,388	177	1,733	398	771
Wellington	98	1,336	83	1,578	181	724
Hamilton-Wentworth	450	914	445	924	895	459
Metro Toronto	2,864	745	2,762	772	5,626	380
York	205	1,186	144	1,860	349	685

1) Figures based on December 31st physician registration.
2) County ratios are obtained by using December 31, 1980 physician figures with June 1980 county population.

Source: College of Physicians and Surgeons of Ontario Licensing Statistics.

Source: Ontario Statistics 1981

registered nurses per 100,000 population varies from 296 to 1,165 (Figure A-23). The population per dentist varies from 1,487 to 11,736 (Figure A-24).

County-based figures may not tell the full story, however, for most of the resources may be concentrated in one city, leaving the rest of the county's population under-serviced.

Other health disciplines which tend to be in short supply in Canada outside the major urban areas are rehabilitation therapists (e.g., physiotherapists, occupational therapists, etc.), and speech pathologists and audiologists.

6.3.2 Physical Plant and Equipment Deficiencies

In general, the Canadian health care system is well-housed and well-equipped, but there are some communities which require replacement of aging resources, or new construction in an effort to attract practitioners. However, these deficiencies normally are secondary to manpower shortages.

Figure A-23

Registered Nurses Employed, by County, Ontario, 1980

	Estimated Population[1]	Registered Nurses Employed[2]	Ratio per 100,000
Ontario	8,570,400	61,228[3]	714.4
Algoma	130,158	869	667.7
Brant	102,441	701	684.3
Bruce	58,864	271	460.4
Cochrane	84,256	575	682.3
Dufferin	30,497	163	534.5
R.M. of Durham	276,824	1,642	593.2
Elgin	69,465	551	793.2
Essex	316,778	1,995	629.6
Frontenac	115,452	1,345	1,165.0
Grey	73,066	677	926.6
Haldimand-Norfolk	91,389	412	450.9
Haliburton	11,148	33	296.0
Halton	248,011	1,315	530.2
Hastings	106,045	749	706.3
Huron	56,054	341	608.3
Kenora	58,004	345	594.8
Kent	106,636	775	726.8
Lambton	124,298	798	642.0
Lanark	45,290	375	828.0
Leeds & Grenville	81,133	640	788.8
Lennox & Addington	32,580	137	420.5
Manitoulin	11,105	45	405.2
Middlesex	325,634	3,472	1,066.2
Muskoka	38,189	226	591.6
R.M. of Niagara	367,665	2,231	606.8
Nipissing	80,362	624	776.5
Northumberland	64,937	358	551.3
Ottawa-Carleton	548,096	5,366	979.0
Oxford	84,631	587	693.6
Parry Sound	33,526	139	414.6
Peel	460,791	1,568	340.3
Perth	65,926	516	782.7
Peterborough	102,409	860	839.8
Prescott & Russell	52,453	166	316.5
Prince Edward	22,130	107	483.5
Rainy River	23,171	134	578.3
Renfrew	86,661	627	723.5
Simcoe	221,776	1,375	620.0
Stormont, Dundas & Glengarry	101,593	717	705.8
Sudbury	185,321	1,160	625.9
Thunder Bay	151,802	1,274	839.3
Timiskaming	41,105	286	695.8
Victoria	47,533	231	486.0
Waterloo	306,776	1,843	600.8
Wellington	131,013	903	689.2
Hamilton-Wentworth	411,545	3,573	868.2
Metro Toronto	2,136,493	16,970	794.3
York	239,118	1,133	473.8

1) Population estimates June 1980 (Treasury and Economics)
2) Registered nurses employed as at February 15, 1980
3) Includes 28 non-respondents

Source: College of Nurses of Ontario

Source: Ontario Statistics 1981

Figure A-24

Dentists, by County, Ontario, 1979

	Estimated Population[1]	Dentists[2]	Population Ratio
Ontario	8,503,300	4,186	2,031
Algoma	128,234	48	4,672
Brant	102,172	37	2,761
Bruce	59,518	28	2,126
Cochrane	94,784	18	5,266
Dufferin	30,165	12	2,514
R.M. of Durham	274,847	120	2,290
Elgin	69,205	18	3,845
Essex	318,375	137	2,324
Frontenac	114,599	56	2,046
Grey	72,838	27	2,698
Haldimand-Norfolk	90,589	24	3,775
Haliburton	11,130	2	5,565
Halton	244,412	117	2,089
Hastings	105,973	45	2,355
Huron	55,872	15	3,725
Kenora	58,064	19	3,056
Kent	107,691	39	2,761
Lambton	123,601	47	2,630
Lanark	45,130	18	2,507
Leeds & Grenville	80,854	28	2,888
Lennox & Addington	32,862	3	10,954
Manitoulin	10,868	4	2,717
Middlesex	321,865	215	1,497
Muskoka	37,993	15	2,533
R.M. of Niagara	367,672	167	2,202
Nipissing	79,633	34	2,342
Northumberland	64,800	19	3,411
Ottawa-Carleton	544,299	305	1,785
Oxford	84,748	38	2,230
Parry Sound	33,313	12	2,776
Peel	432,156	187	2,311
Perth	66,156	23	2,876
Peterborough	101,590	45	2,258
Prescott & Russell	52,201	16	3,263
Prince Edward	22,330	6	3,722
Rainy River	23,546	8	2,943
Renfrew	87,728	33	2,658
Simcoe	218,037	87	2,506
Stormont, Dundas & Glengarry	101,270	23	4,403
Sudbury	186,647	60	3,111
Thunder Bay	151,333	67	2,259
Timiskaming	41,356	24	1,723
Victoria	46,945	4	11,736
Waterloo	303,017	145	2,090
Wellington	128,870	60	2,148
Hamilton-Wentworth	411,311	208	1,977
Metro Toronto	2,132,726	1,434	1,487
York	229,975	89	2,584

1) Population estimates June 1979 (Treasury and Economics)
2) Royal College of Dental Surgeons of Ontario Statistical Report.

Source. Royal College of Dental Surgeons of Ontario.

Source: Ontario Statistics 1981

APPENDIX B

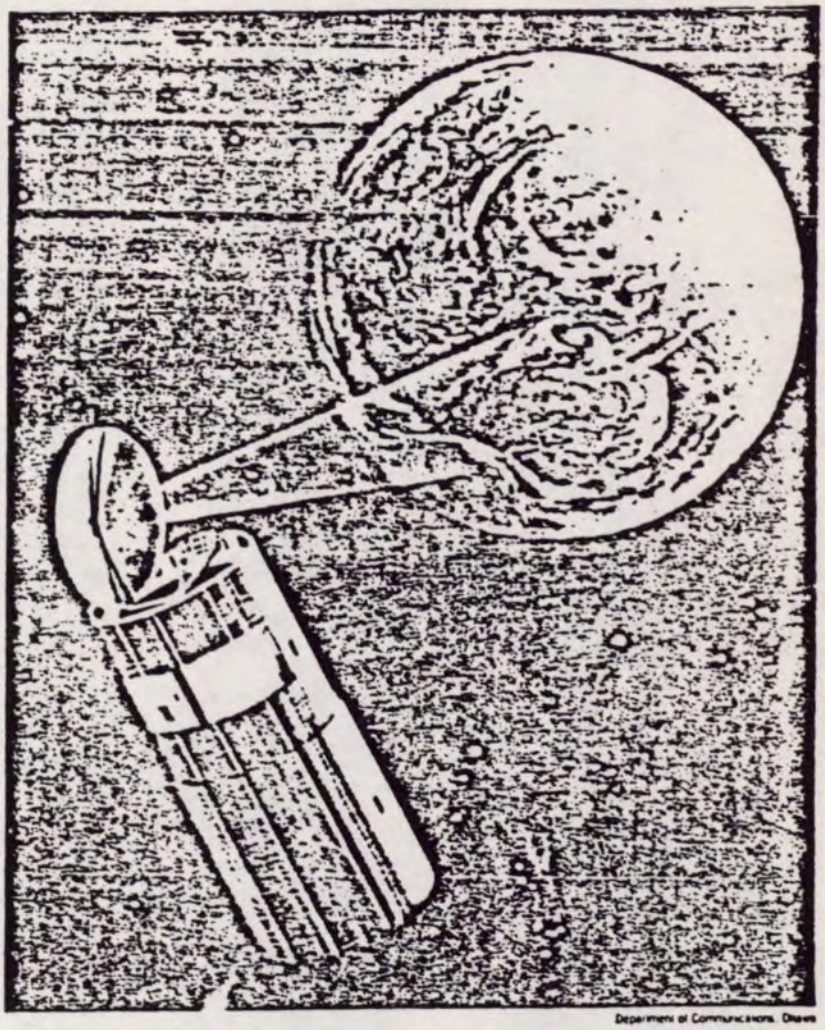
Education

Satellite contributions to telemedicine: Canadian CME experiences

JOE CHOUINARD

Distance, climate and patterns of population distribution combine to create special challenges in the delivery of health care in Canada, particularly in the North. Health care professionals working in remote areas have limited access to continuing education programs, and often practise without contact with consulting services in the few large metropolitan areas. For these professionals and their patients, as well as for countless other professionals in remote sites, the potential benefits of communications technology are immense and have long been recognized in Canada. Hence the reason the federal government recently gave high priority to the development of such technology.

This priority reflected the government's policy to focus on a few sectors of high technology that promised solutions to the problems particular to the North because of its size and long cold winters. Concentrating on the fast-growing, high-technology sectors was regarded as critical to Canada's long-term economic future, but the government recognized the impracticality, indeed the impossibility, of trying to keep all the technologic bases covered given the relatively small population base. Thus, Canada has tended to focus on sectors in which it has a comparative and technologic advantage or an established or emerging technologic capability. Satellite communication is one such sector; it is being moved from the innovation phase to the commercialization phase: today we are preparing for



Department of Communications, Ottawa

The use of telecommunications technology in continuing medical education will mushroom during the next two decades, influencing our lives in both foreseen and unforeseen ways.

Mr. Chouinard is the coordinator of CMA's council on medical education.

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new challenges in putting space technology to work, cooperating with other nations to develop international services and building satellite systems for other countries.

It has been more than 20 years since the launch of Alouette 1, when Canada first entered the space age and joined two nations that had already taken that step — the United States and the Soviet Union. The resulting excitement and exploration led to a search for the practical application of satellites.

Canada became the first nation to develop a domestic telecommunications system with a satellite in geostationary orbit. Anik-A-1, launched in 1972, was placed in such a way that it could remain in the same position at all times, thereby providing reliable and continuous telecommunications services. Anik A-2, launched in 1973, brought network radio, television and improved telephone services to the North, and Anik A-3, launched in 1975, provided additional channel capacity.

The Anik-A satellites operate in the lower frequency bands of 6/4 GHz, the same bands used by the terrestrial microwave system to carry telephone traffic.

Meanwhile, the government continued to study new satellite technologies, working with researchers in the United States. The two countries combined their expertise to design and develop the Communications Technology Satellite Hermes. When it was launched in 1976, Hermes was the world's most powerful communications satellite. It operated for 4 years — twice its expected lifespan — and was used for many technical and social experiments, including trials of telemedicine, tele-education and direct broadcasting to Canada's northern, rural and remote areas. Hermes was the first satellite to operate in the 14/12 GHz bands; the engineers who had developed it wanted to avoid any interference with the terrestrial microwave system. The advances with Hermes allowed the use of smaller, less expensive ground stations and made satellite services more accessible.

One of Hermes' striking successes was vindication of the belief that the higher frequency could be used successfully for various satellite com-

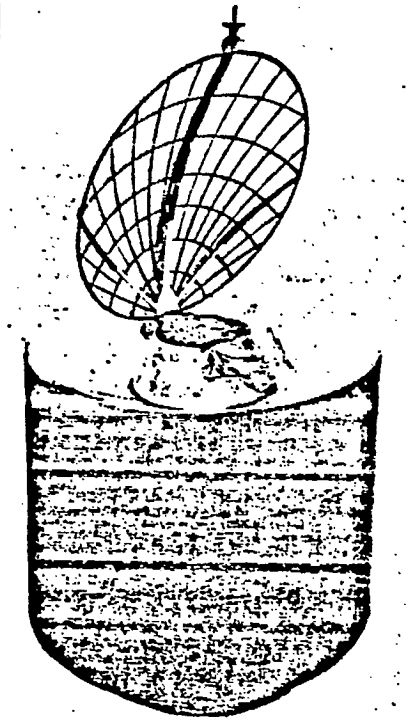
munications services. Now the Anik-B and Anik-C satellites have a 14/12 GHz capacity.

More than 20 Canadian organizations have engaged in 15 technical and 22 social experiments, including direct-to-home television and radio broadcasting, tele-education, telemedicine, community interaction and administrative services, all of which were forerunners to the Anik-B communications pilot projects.

The first of three telehealth experiments with Hermes was begun in October 1976 at the University of Western Ontario in London, Ont., where a project to provide medical services to remote areas was already under way. The experiment lasted 5 months and provided an audio link between a remote nursing station in Kashechewan, Ont. and a base hospital in Moose Factory, Ont., and both audio and video two-way links between Moose Factory and University Hospital in London. The nursing stations were equipped to produce x-ray and fluoroscopic films, which were interpreted by experts at the university who advised on and guided the treatment. The system functioned very effectively for 90% of the radiologic and fluoroscopic examinations interpreted over the link, but the cost of broadband satellite telecommunications for live film interpretation precluded their regular use.

Indirect results from this experiment included a continued audio link by microwave between the remote stations. The Department of Communications (DOC) and the Department of National Health and Welfare (DNHW) conducted an 11-month study of 11 nursing stations in the Baffin Zone in the far north to identify their telecommunications problems, and in 1979 DNHW completed a 12-month randomized study of patient evacuation from Moose Factory. The latter showed that a 24-hour, high quality telephone service was fundamental to the health care delivery system, and that the cost of providing nursing stations with complex diagnostic equipment and the advanced communications systems that this equipment required could not be justified by the frequency of use.

The interactive broadband telehealth project currently under way at the University of Western Ontario may be an indirect result of the early Hermes experiment.



Department of Communications, Ottawa

Anik-A-1, launched in 1972, was placed in such a way that it could remain in the same position at all times, thereby providing reliable and continuous telecommunications services.

The second Hermes experiment was done at Memorial University of Newfoundland in St. John's, which has a long and varied experience in outreach education, particularly in sending videotaped programs to adult students in remote areas. The Hermes experiments were seen as an avenue for interaction with students, a desirable and essential feature in teaching learning exercises.

After 5 years of planning, a 3-month experiment was performed in 1977 at the Health Sciences Centre of Memorial University, which was linked to four peripheral hospitals via one-way video and two-way audio communications. This was the first attempt to provide continuing medical education (CME) from a Canadian medical school to remote areas via satellite. Although funding was a big problem, the experimenters were enthusiastic and several important spin-offs ensued.

The 150 hours of programming demonstrated clearly that one-way television and two-way voice provided an ideal interaction for CME programs. However, live video in real time is expensive, and "talking heads" were judged unnecessary to meet the objectives of the project. The satellite link was thus abandoned, CME staff at Memorial University concluding that it could meet programming needs with an audio system supported by slides, lecture notes and other printed material. A ground-based teleconferencing system was developed that linked 13 hospitals in the province; it has since been expanded to all 38 hospitals, all 15 vocational education schools and several other educational and health institutions. This is a four-wire dedicated network. Microphone/speaker kits are used in each of 60 conference rooms in 40 communities; it is thus possible to establish links with three institutions in every community, wiring as many as three rooms in each institution. The quality of voice is considerably better than that provided by telephone, and equipment on site makes for easy interaction. The equipment is leased from the provincial telephone company. For a time, the Anik-B satellite was used to reach some of the isolated communities in Labrador, but, again, the costs could not be justified.

A slow scan experiment, another, later project using the Anik-B satellite, a successful counselling program for parents of hearing-impaired children, and, finally, the current large audio teleconferencing system can all be attributed to the early satellite experiments.

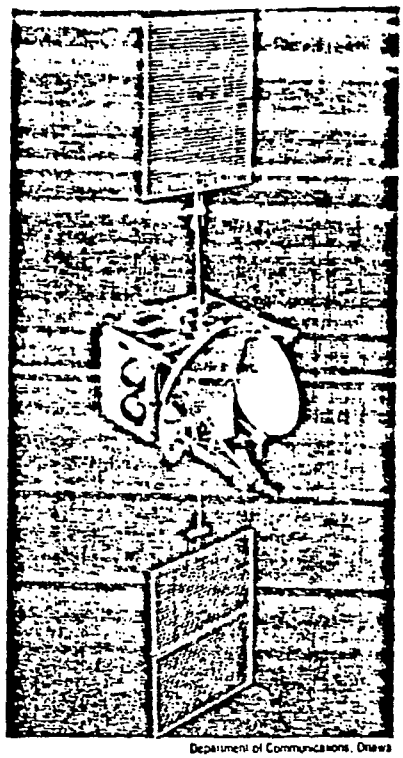
The third Hermes telehealth experiment, the community health education project Ironstar, was done in northern Alberta, and concentrated on the production and broadcast of native health information programs. From all the experiments for telehealth and telemedicine it was concluded that terrestrial telecommunications — telephone links — could be used for virtually anything that had been done via Hermes.

The launch of Anik-B in 1978 ushered in the first direct broadcast from satellite to earth. Anik-B was also the first hybrid satellite, carrying 12 channels in the 6/4 GHz band and 6 in the 14/12 GHz band. For the past 4 years it has served as both a commercial satellite and an experimental vehicle for following up the Hermes experiments.

So accurate is its three-axis stabilization and control system that Anik-B can be held in position within a tolerance of 1/20th of a degree of latitude and longitude. Thus, only one of the earth's stations using Anik-B is equipped with tracking antennae, and many of the dishes receiving the signals are only 1.2 m in diameter.

Telesat Canada leased to the DOC for 2 years all Anik-B's 14/12 GHz capacity for 16 pilot projects; the lease was later extended to allow 19 projects to be done, some of which were extensions of those begun in the first 2 years. One of the channels was leased back to Telesat in 1980 and then to La Sette, a consortium of cable companies in Quebec, which used the channel to distribute videotaped programming from France to the cable stations in Quebec. Hence the first commercial service in the 14/12 GHz band.

For the Anik-B program, the DOC provided satellite time, equipment, technical advice and other assistance to a range of pilot project sponsors, including public, private, community and special interest groups. The projects involved the distribution of broadcast programs, community communications and tele-education, telehealth, business and government communications as well as technical experiments. The DOC offered free channels, earth terminals, maintenance and consultation and the users were to provide interface equipment such as monitors, recorders and cameras.



Department of Communications, Ottawa

The launch of Anik-B in 1978 ushered in the first direct broadcast from satellite to earth. For the past 4 years it has served as both a commercial satellite and an experimental vehicle for following up the Hermes experiments.

Of the 36 proposals submitted, 19 were approved, 2 of which were for telehealth communications, 1 at the University of Montreal and 1 at Memorial University.

The Montreal project provided a broadband link between a hospital at the James Bay hydroelectric development site in northern Quebec and the Hotel-Dieu and Sacre-Coeur hospitals in Montreal between April and September 1979. In the second phase, from January to August 1980, all three hospitals were linked by narrowband for a comparison study in teleradiology. The underlying hypothesis was that health care personnel from a specialized urban hospital could offer valuable support to general practitioners and nursing personnel in isolated locations.

It was found that slow-scanning was much less satisfactory than real-time broadband reception of educational programs and roentgenograms. The results also indicated that the accuracy of interpretation of roentgenograms in the first phase of the project was 11% less than that achieved from actual viewing of the films. In addition, considerably more time was required to interpret the films via narrowband links.

Memorial University used Anik-B in a narrowband project to provide audio links with Labrador as part of the existing terrestrial teleconferencing system. In addition it was used in 1980 to explore the health care needs of staff in offshore exploration operations. A terminal was installed on the Petro Canada drillship *Nedrill* and linked via satellite with a terminal on the university campus that has a cable link to the Health Sciences Centre. For 10 days, a high-quality audio link was established and pictures were transmitted by slow-scan equipment. The fixed terminal proved reliable except when the ship was moving excessively. This equipment kindled interest in satellite links with offshore drilling installations.

Now, Memorial University, in collaboration with the DOC and the Newfoundland Telephone Company, is placing a special terminal on one of Mobil's drill rigs in the Hibernia area, an inhospitable locale where icebergs begin their migration South and constantly threaten oil exploration operations. Anik-B will be used for several months to evaluate a communications system that will support health care services, provide education and training programs and satisfy industrial purposes. With the system in place, both routine and emergency care will be possible.

During an emergency or disaster the rig can be linked through the

established teleconference system with numerous medical, government and emergency organizations in the province. In areas with more than one platform in a field, it is hoped that all the platforms will be linked to the satellite by a microwave system.

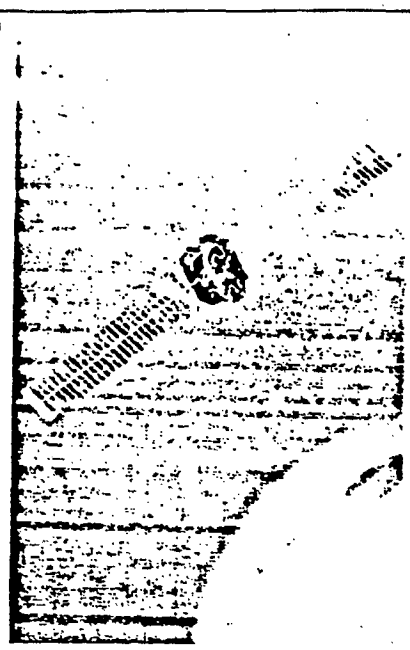
In British Columbia the Knowledge Network, which uses Anik-B, has contributed much to adult education in that province. This network is one of the most innovative electronic distribution systems in the world. It marries satellite cable systems, microwave systems, instructional television, fixed service and local low-power rebroadcast transmitters in a totally unique manner. It serves 80% of homes in the province and has numerous educational applications. A slow-scan link between two Vancouver hospitals has been initiated for the terrestrial transmission of nuclear medicine images, and a proposal has been made for genetic counselling via the use of the satellite and a slow-scan link.

On the basis of our experience there is no question that satellites "work" in CME. They can improve physicians' access to education, providing ease of communication in problem sharing for those who may be working in isolated areas. However, at present the use of satellites is not cost-effective; there are less expensive alternatives in telemedicine that can meet the educational objectives.

The roots of the development of telemedicine and all its methods are many. The telephone was used very early for medical consultation, and the transmission of electrocardiogram tracings began early in the 1930s. Reliable, closed-circuit television and video equipment also contributed. However, early satellite experimentation provided the real impetus for telemedicine.

Although the use of satellites is exciting, the ingeniousness of the medium will never compensate for the deficiencies in the message. Educators recently have been subjected to a flood of data about new ways to deliver information to their audiences. If the sales representatives are to be believed, the delivery system is to be regarded as somewhat more important than the information it delivers. The experiments at Memorial University indicate that sophisticated systems are not necessarily more successful than the simple, less costly ones.

Satellite applications in CME were appropriate when the Canadian government was soliciting telemedicine proposals for Hermes. Technology was in search of problems to solve. However, it is questionable whether they are appropriate yet for single uses such as CME, when other uses for satellite communications — uses that reach large audiences — are proving to be cost-effective.



Department of Communications, Ottawa

When it was launched in 1976, Hermes was the world's most powerful communications satellite. It operated for 4 years — twice its expected lifespan — and was used for many technical and social experiments.

The size of the audience is the key to the cost-effective use of satellites. To be cost-effective, such medical education programming would have to be broadcast to many thousand physicians in North America. Could it then still meet the need of its audience? Perhaps. Education must be catered to individual needs, and, though this type of programming could supplement other methods of CME, the real opportunities for teaching and learning, so dependent on student/teacher interactions, are currently found in less expensive applications of telemedicine.

The use of telecommunications technology in CME will mushroom during the next two decades, influencing our lives in both foreseen and unforeseen ways. There are many advances and changes, even as we all write papers and discuss problems. The Alliance for Continuing Medical Education (ACME) is a forum of CME providers and "doers". Its members are interested in methods that work. How might they build on what has been done and what is now taking place?

Health care users of satellite technology, or any other new information technology, are not well organized. A greater degree of coordination and sharing of ideas and results of research, and integration is therefore needed. A great deal of time and money could be saved if new researchers had easy access to the results obtained by the existing cadre of researchers. To this end ACME could act as an information clearinghouse as well as assume a role in coordinating research.

Satellites will be used to network and link already existing land lines and microwave systems; they will not be used exclusively for CME technology. Such networks will have to have shared channels to be cost-effective. Programs must be produced by physicians in collaboration with experts in video communications. The educators must be willing to abandon conservative attitudes towards providing medical education and embrace interesting, innovative methods. ■

APPENDIX C

Glossary of Terms

Technical

Amplifier	Devise used to increase signal strength.
Analog Signal	A signal in the form of a continuously varying physical quantity such as voltage, which reflects variations in some quantity, such as loudness of the human voice.
Antenna	Device used to pick up off-air television signals.
Asynchronous transmission	Transmission in which each information character, or sometimes each word or small block, is individually synchronized, usually by the use of start and stop elements. Also called start-stop transmission.
Audio	Pertaining to sound.
Audio frequencies	Frequencies that can be heard by the human ear (usually 30 to 20,000 hertz).
Audio teleconferencing	Conferencing by the use of an audio-only signal, usually refers to telephone land-line communication but could be done using satellite communication.
Audio-video modulator	Sometimes called a transmitter, which is a unit that accepts audio and video signals from videotape playback machines and/or live camera sources and provides a modulated radio frequency output, which allows injection into the off-air television signals through the distribution system.
Bandwidth	The difference in cycles per second, or hertz, between the high and low frequencies of a band.
Baud	Unit of signaling speed. The speed in bauds is the number of discrete conditions or signal elements per second.
Booster amplifier	Sometimes used to designate small amplifiers.

Bridge	Electronic device which links more than two telephone/communications lines.
Broadband	Communication channel having a bandwidth greater than a voice grade channel, and therefore capable of higher-speed data transmission.
Broadcasting service	A radiocommunication service of transmission to be received directly by the general public. It can comprise sound, video, facsimile, or other one-way transmission.
Channel	A path for electrical transmission between two or more points without common-carrier-provided terminal equipment. Also called circuit, line, link, path or facility.
Channel, voice-grade	A channel suitable for transmission of speech, digital or analog data, or facsimile, generally with a frequency range of about 300 to 3000 Hz.
Circuit	1. A means of two-way communication between two or more points. 2. A group of components connected together to form a specific function.
Circuit, four-wire	A circuit formed by two conductors insulated from each other that can be used as either a one-way transmission path, a half-duplex path, or a duplex path.
Closed circuit TV (CCTV)	Television system in which signals are sent (usually via cable) to selected viewing points throughout the distribution system.
CNCP Broadband	Trade name used for a 4-wire data communications network with voice teleconference service option.
Coaxial cable	Cable consisting of an outer conductor surrounding an inner conductor, separated from each other by insulating material, that can carry a much higher bandwidth than a wire pair.
Codec	Coder-decoder (analog-to-digital and digital-to-analog converter) used to convert analog signals such as speech, music, or television, to digital form for transmission over a digital medium, and back again to the original analog form.

Conference Operator	Arranges multipoint conferences; Bell Canada "Conference Call" service: call telephone operator at "0" and designate required locations; CNCP "Conference Call" service: subscribers call 784-2008 and designate Broadband locations.
Conference 2000	Handsfree addition to regular telephone which allows a relatively large group to participate at one location; uses voice-switching to reduce probability of audio feedback; sensitive to voices within three metres.
Communications satellite	Earth satellite designed to act as a telecommunications radio relay, and positioned in geosynchronous orbit 22,300 miles above the equator so that it appears from earth to be stationary in space.
Convener	Piece of station or centre equipment designed specifically for audio teleconferencing.
Converter	Unit used to convert one frequency to another, as for example, UHF converters convert UHF channels (14 through 83) to VHF channel frequency (2 through 13).
Dedicated	Used exclusively for a single purpose or by a single subscriber.
Dedicated circuit	Line used exclusively by one person at each end for communications.
Digital signal	A discrete or discountinuous signal; one whose various states are discrete intervals apart.
Downlink	Satellite receiving station (see TVRO).
Duplex circuit	A circuit used for transmission in both directions at the same time. It can be called "full duplex" to distinguish it from "half duplex".
Duplex transmission	Simultaneous two-way independent transmission in both directions. Also called full duplex transmission.
Earth terminal	A device to send signals to or receive signals from a satellite (see Uplink and Downlink).
Electronic Blackboard/Tablet	System for sending written messages over telephone line; sender writes on normal-looking chalkboard and writing appears in another location on television monitor; interaction is possible when both locations have monitors and electronic blackboard/tablet.

Facsimile — A system for the transmission of images. The image is scanned at the transmitter, reconstructed at the receiving station, and duplicated on some form of paper.

Feedback — Audio interference or "squealing" caused when voices received in a location are picked up and returned to originating point.

Fiber optic waveguides — Thin filaments of glass or other transparent materials through which a light beam can be transmitted for long distances by means of multiple internal reflections.

Footprint — Selected area on the earth's surface where the signal of a satellite is distributed.

Four-wire — Network containing two separate transmission paths for sending and receiving; allows simultaneous 2-way and independent transmissions in both directions; provides better audio quality.

Frequency bands — Frequency bands are defined arbitrarily as follows:

Range-megahertz	Name
Below 3	Low frequency (LF)
3 -30	High frequency (HF)
30-300	Very high frequency (VHF)
300-3,000	Ultra high frequency (UHF)
3,000-30,000	Super high frequency (SHF) (microwave)
30,000-300,000	Extremely high frequency (EHF) (millimeterwave)

Full duplex — Refers to a communications system or equipment capable of transmission simultaneously in two directions.

Geosynchronous satellite — Satellite that travels at a rate of speed equal to the speed of the earth's rotation. These satellites are situated 22,300 miles from the earth.

Ground circuit

1. A circuit in which energy is carried one way over a metallic path and returned through the earth.
2. A circuit connected to earth at one or more points.

Half-duplex circuit	A circuit designed for transmission in either direction but not both directions simultaneously.
Handshaking	Exchange of predetermined signals for control when a connection is established between two modems or other devices.
Hea d-end	Antennas, signal processing, and amplifying equipment portion of any master antenna television system.
Hertz (Hz)	A unit of frequency equal to one cycle per second.
Instructional television fixed service (ITFS)	Special microwave frequencies that can be received only by television installations equipped with a converter to change signals back to those used by a television set. With a range of 30-50 miles, ITFS is intended for school systems or other educational purposes. Its use for commercial purposes is prohibited.
Intelligent terminal	A terminal that is programmable and can process its messages, typically comprised of a CRT, keyboard, microprocessor, and local storage.
Intelsat	The International Telecommunications Satellite Consortium, formed in 1964 with the purpose of creating a worldwide communications satellite system.
Leased circuit	Telecommunication circuit leased by a user or group of users for exclusive use between certain locations. No switching is employed, so the circuit is ready for immediate use. It may be point-to-point or multidrop and is sometimes referred to as a private line.
Microwave (wavelength)	Electromagnetic waves in the radio frequency spectrum above 890 MHz (the frequencies between 1 GHz and 30 GHz).
Multiplexer	A device which enables more than one signal to be sent simultaneously over one physical circuit.
Multiplexing	The division of a transmission facility into two or more channels either by splitting the frequency band transmitted by the channel into narrower bands, each of which is used to constitute a distinct channel (frequency-division multiplex), or by alloting this common channel to several different information channels, one at a time (time-division multiplexing).

Multipoint circuit	A circuit connecting 3 or more locations (also known as a multidrop circuit).
Narrowband	A communications channel suitable for voice-grade transmission.
Network	1. A series of points connected by communications channels. 2. The switched telephone network is the network of telephone lines normally used for dialed telephone calls. 3. A private network is a network of communications channels confined to the use of one customer.
Node	In a topological description of a network a node is a point of junction of the links; also a switching center used in data networks, particularly in the context of packet switching.
Packet	A group of binary digits including data and call control signals which is switched as a composite whole. The data, call control signals, and error control information are arranged in a specified format.
Packet switching	The transmission of data by means of addressed packet whereby a transmission channel is occupied for the duration of transmission of the packet only. The channel is then available for use by packets being transferred between different data terminal equipment.
Packet switching network	A network designed to carry data in the form of packets. The packet and its format is internal to that network. The external interfaces may handle data in different formats, and conversion is done by an interface computer.
Private Line Network	Network composed of channels or circuits exclusively for use of subscriber.
Protocol	Strict procedure required to initiate and maintain communication. Protocols can exist at many levels in one network such as link-by-link, end-to-end and subscriber-to-switch.
Radio communication	Any telecommunication by means of radio waves.
Radio wave	Electromagnetic waves of frequencies between 10 kHz and 3 MHz, propagated without guide in free space.

Scrambler	Coding device applied to a digital channel which produces an apparently random bit sequence. A corresponding device is used to decode the channel, i.e. the coding is reversible.
Simplex circuit	A circuit permitting the transmission of signals in one specified direction only.
Slow Scan/Freeze Frame	System for exchanging still video images displayed on television monitors; using narrowband transmission channels (often a normal telephone line).
Speakerphone	Telephone device which has a speaker microphone unit that allows hands-free conversation.
Synchronous	Having a constant time interval between successive bits, characters, or events.
Synchronous network	A network in which all the communication links are synchronized to a common clock.
Synchronous transmission	Transmission process where the information and control characters are sent at regular clocked intervals so that the sending and receiving terminals are operating continuously in step with each other.
Telecommunication	Any process that permits the passage of information from a sender to one or more receivers in any usable form (printed copy, fixed or moving pictures, visible or audible signals, etc.) by means of any electromagnetic system (electrical transmission by wire, radio, optical transmission, guided waves, etc.). Includes telegraphy, telephony, video-telephony, data transmission, etc.
Telecopier	Device that sends page copies over telephone lines to a terminal at a different location.
Teletext	One way broadcast of text and graphics to a display device, usually a home TV set.
Teletype	Trademark of Teletype Corporation, usually referring to a series of different types of teleprinter equipment such as tape punches, reperforators, page printers, etc., utilized for communications systems.

Teletypewriter exchange service (TWX)	A public switched teletypewriter service in which suitably arranged teletypewriter stations are provided with lines to a central office for access to other such stations throughout the U.S.A. and Canada.
Telex service	A dial-up telegraph service enabling its subscribers to communicate directly and temporarily among themselves by means of start-stop apparatus and of circuits of the public telegraph network. The service operates world wide using Baudot equipment.
Telidon	A two-way interactive television system which accesses stored, written and graphic information using telephone lines, a computer terminal, and TV screen.
Tie Line	Private line communications channel provided to link two or more switchboards; rented by themonth for unlimited use.
Transponder	Electronic package aboard a telecommunications satellite that receives microwave transmission from earth (see Uplink), changes signal frequency, amplifies signal, and transmits to earth (see Downlink).
TVRO	Television receive-only earth station.
Two-wire	(half duplex) basic network, consists of two-wire circuit; only one transmission path for sending and receiving; messages are mixed; regular telephone network employs mainly two-wire circuits; voice switching is often used on two-wire networks to reduce feedback.
Uplink	Satellite transmitting station; also capable of receiving.
Voice Clipping	Momentary loss of audio transmission; occurs through use of voice-switched equipment when two people speak simultaneously; since circuit allows only one location to be heard at a time, the other will be cut off when interrupted.
Voice frequency, telephone frequency	Any frequency within that part of the audio-frequency range essential for the transmission of speech of commercial quality, i.e., 300-3000 Hz.

Voice-grade	A telecommunications link with a bandwidth (about 3kHz) appropriate to an audio telephone line.
Voice grade channel	A channel suitable for transmission of speech, digital or analog data, or facsimile, generally with a frequency range of about 300 to 3,000 Hz.
Voice switching	Electrical technique for opening an audio circuit only to person currently speaking; allows only one person to speak at a time, interruptions will result in voice clipping.
Video	(a) Picture portion of a telecast (b) Nonbroadcast production activities and the use of small format equipment for a variety of purposes. The equipment usually includes a portable camera, a microphone, a videotape recorder or videocassette recorder, and a monitor.
Video signal	A signal comprised of frequencies normally required to transmit pictorial information (1 to 6 MHz).
Video Teleconferencing	Audio plus full visual conferencing for a group; typical system provides room-to-room linkages with live television and voice communication.
Videotext	Two way interaction of text and graphics to display usually involving a TV set and computer terminal.
Wats	Wide area telecommunication service. A service provided by telephone companies which permits a customer by use of an access line to make calls to telephones in a specific zone on a dial basis at a lower cost or to receive incoming calls at a specified number at a reduced cost.
Wideband channel	A channel wider in bandwidth than a voice-grade channel.

APPENDIX D

DESCRIPTION OF ALTERNATE DELIVERY METHODS

Following is a brief overview of those alternate delivery methods which are described in the System Concepts section of our report. We have focused on those delivery methods that are part of our most promising concepts.

Audio Teleconferencing

The simplest type of interactive audio terminal is, of course, the telephone handset. When these devices are connected together, generally via the public switched telephone network, verbal interaction between geographically separated persons is possible.

In communicating via audio teleconferencing, where it is necessary that more than one person at any location participate in the discussion, the telephone handset may be replaced by a hands-free device such as the Speaker Phone^{RT} or Conference 2000^{RT} offered by Bell Canada. Once the telephone connection is made, these devices enable the users to verbally interact with geographically separated groups of people without the necessity of operating any controls on the terminal device. In order to prevent audio feed-back, which is extremely annoying to an ongoing discussion, telephone hands-free devices are generally fitted with a voice switching (vox) facility which automatically switches the device to either a transmit or to a receive mode, depending on the conversation flow. Free-flowing, simultaneous interaction between groups at different locations is, therefore, not possible, utilizing this telecommunications mode.

Alternatively, users may prefer to use an audio conference terminal system which works off the standard two-wire

telephone network, but which consists of separate loudspeaker and microphone sub-systems. A good example of such a system is the portable Darome Convenor Model 610.

As mentioned, two-wire audio systems have certain operational characteristics which may not be suitable for particular applications where free-flowing, verbal interaction amongst participating groups is considered important. For this type of application, therefore, four-wire audio conference terminals such as the Tech 5 Conference Terminal or the Darome Convenor Model 611 may be used in conjunction with a dedicated four-wire public network facility such as the CN/CP broadband network.

Some of the technical and operational factors which must be considered in the selection of audio teleconferencing equipment are:

- o network facilities over which the equipment will be working
- o audio quality
- o hands-free operation versus press-to-talk
- o ease of operation and control
- o portability - is it designed for a fixed location or can it be easily transported over standard, readily-available transportation systems?
- o physical characteristics
- o maintenance

Augmented Audio Conferencing

Audio conferencing can be augmented utilizing hard-copy telecommunication systems which permit information in alpha-numeric, graphical or pictorial format to be received in a physical output form via appropriate telecommunication network transmission facilities.

Hard-copy telecommunication systems range from relatively simple electro-mechanical pens such as the Telenote/Telecreen system, through teletypewriter terminals used on the international Telex systems, to complex computer graphics systems (Telidon). Although these systems differ in specific design and sophistication, their common feature is their ability to generate graphics or written information in hard-copy form at the receiving end.

Another form of augmentation is in the utilization of slow-scan television. Slow-scan television systems (SSTV) have the ability to transmit still or "frozen" pictures over a voice-grade telephone line, an FM radio channel or even a communications satellite link and display the image on a TV monitor at the distant end. Any image that can be captured by a video camera can be shown on an SSTV system, including views of handwritten and prepared graphics, X-rays, and people. In most cases the received picture forms gradually, starting at the top of the screen and moving down.

The basic elements in an SSTV system are a video camera, transmitter, receiver (or transreceiver), modem, TV monitors and the interconnecting telecommunication network facilities. In addition, auxiliary devices can be interfaced to the system. These units include video pointers, tape recorders, large screen projectors, special camera lens, and frame-storers/grabbers for extra frame storage and hard-copy reproduction of the images.

Selection and implementation of an SSTV system requires consideration of a number of technical, operational and economic parameters. The degree of significance of each parameter depends upon

the type of application or the communication needs to be met. Listed below are a number of factors which should be evaluated in the selection of an SSTV system.

- o picture resolution - the higher the resolution required (i.e. number of lines per frame), the longer it takes to transmit the picture
- o transmission time - depending on type of equipment and the telecommunications network utilized, it can take anywhere from two seconds to 35 seconds to transmit a picture
- o colour - if colour is required, equipment cost can increase by a factor of five - also transmission times over comparable network facilities used for black and white SSTV systems can also increase by a factor of four to six
- o gray scales (for black and white SSTV only) - 'picture quality' is determined by 'picture resolution' and the number of 'gray scales' - the larger the number of gray scales, the better the picture quality and the longer it takes to transmit the picture
- o type of storage/memory system and its capacity - some systems, for example, can store more than one picture at the receiving end for instant review by the user
- o accessories - can the manufacturer/agent provide the customer with appropriate accessories - (special camera lens, frame grabber, electronic pointer, tape recorders for simultaneous voice/video recordings, etc.) to "fine tune" the system to meet the customers' needs?
- o portability - is the equipment designed to operate on a fixed mode basis or is it designed as a transportable system?

- o easy-to-use - how easy is it to train someone to use the equipment?
- o maintenance - how will the equipment be maintained or be repaired in case of failure?
- o network facilities - if telephone facilities are not available in the area, or are unreliable or inadequate, can the system work on an alternative network which might be available in the area?
- o equipment cost

Real-Time Video Conferencing

Unlike SSTV systems, real-time (or full motion or fully-animated) voice systems have the ability to transmit moving images in monochrome (black and white - b/w) or colour, similar to our standard broadcast TV sets.

Interactive video teleconferencing systems can be either two-way audio plus one-way video, as in the case of the Canadian Teleconference Network or full two-way audio and video as in the case of the Ontario Government Video Teleconferencing System.

Because a "moving" picture requires the sending of significantly more information than SSTV systems in a given time, high-capacity or broad bandwidth transmission network facilities are required. As would be expected, these facilities are many times more expensive than standard telephone facilities and may not be readily available in the locations where the service is required.

The basic elements of full-motion video systems are a video camera(s), TV monitor(s), modem(s) and the interconnecting telecommunications network facilities. In fact, a full motion TV

terminal can be less complex than an SSTV system as no electronic package is needed to process the video signals into a slow transmission format. However, a modem is still required to modulate and demodulate the video signals during the transmitting and receiving of the signals, respectively.

Some technical and operational factors to be considered in the design of full-motion interactive video systems are:

- o monochrome versus colour
- o maximum conference room capacity
- o multi-camera versus single camera system
- o operator-controlled versus user-controlled
- o transmission network facilities available
- o fixed versus transportable system
- o video recording and playback capabilities
- o range of user applications
- o equipment maintenance

APPENDIX E

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APPENDIX G

TELECOMMUNICATION NETWORK FACILITIES

As mentioned previously, appropriate telecommunication network facilities are required for the transmission of information from one terminal to another. Accordingly, this section gives a brief overview of the following types of network facilites:

- o voice-grade networks
- o radio networks
- o communication satellite networks
- o terrestrial wide-band voice networks

1. Voice-grade networks

As the name implies, voice-grade networks have the ability to transmit electronic signals in the voice frequency band, ranging from approximately 300 HZ to 2,700 HZ.

The most widely available voice-grade network services are those offered by the local telephone company. Both the availability and relatively low cost of their facilities make them very attractive for transmitting anything from audio to SSTV signals.

In a multi-site type of interaction, where more than two locations are in communication, the telephone company's conference bridging facilities can be used to provide the interconnection. Alternatively, the customer may provide his own conference bridging equipment.

Telephone lines are generally available on a two-wire basis. However, for dedicated, fully duplexed four-wire audio systems, the broadband network services offered by CN/CP can be used. Conference bridging servics are also available from CN/CP. However, the broadband

services are not as widely available as are the two-wire ones offered by the telephone company.

2. Radio Networks

Terrestrial radio network facilities may be used to carry audio, facsimile and SSTV signals in several ways such as:;

- o to extend the telephone network link to an area where services are not presently available (range generally limited to about 30 miles)
- o to provide a dedicated line between a regional/district office and a field office, where range is generally less than 50 miles using standard VHF point-to-point radio systems

3. Communication Satellite Networks

Unlike the two previous network facilities, dedicated satellite network facilities may be used to transmit all the communication modes previously mentioned, as well as real-time video.

Satellite networks are significantly more expensive than telephone networks. However, satellite systems are highly flexible, in the sense that a portable earth station can be taken to a remote location not presently served by telephone facilities and be established within a relatively short period of time.

4. Terrestrial Wide-Band Networks

Wide-band network facilities are required for the transmission of full-motion video and high-speed data. Presently, available transmission facilities fall into the following categories:

- o coaxial cable
- o microwave radio
- o fibre optics
- o laser systems

A decision to use any one of these facilities would depend on the cost and type of user requirements.

TELIDON

Telidon is the Canadian format for videotex and teletext services. Teletext is the broadcasting of information repetitively in the "blanking" interval between frames on a television channel, without affecting the program being transmitted simultaneously. The user selects a teletext "page" by typing in a code number on a special keypad. A decoder attached to the home television then finds that signal and transforms it for display on the T.V. set.

Teletext suffers from a three-way trade-off among the number of pages available, waiting time for the display, and the amount of information in the display. Because of these limitations, teletext usually only carries often requested information such as weather forecasts, news headlines and sports results.

Videotex is a two-way system. Videotex uses telephone lines to transmit only requested information, allowing a much larger data base than is practical for teletext. Besides simple information retrieval like stock-market tables and electronic newspapers, videotex provides interactive services like electronic messaging, teleshopping and games.

The user requests information by punching digits on a special keypad; these signals travel over the phone lines at rates as slow as 75 bits per second. The videotex system's computer retrieves the requested page of the information either from its own data bank or from some other institution's. The information is coded and then transmitted back over the phone line at 1,200 bits per second. The user's terminal decodes the signal for display on a video screen.

A key technology in videotex is the generation of graphics. Telidon utilizes the alphageometric approach, a display is assembled from a large set of "picture description instructions". Each instruction specifies a fundamental shape and where to write it on the screen. This technique makes for smoother displays than other techniques, but causes longer transmission time.

LOCAL AREA NETWORKS

A local area network is a system of multiple interconnected devices that is usually characterized by the following criteria:

- o intra-organization, privately owned, user administered and not subject to regulation - this excludes traditional local connections provided by the telephone company or cable company
- o structured
- o limited in geographical scope
- o high speed
- o supportive of full connectivity

This is a fairly new marketplace and standard solution has yet come to the foreground. Depending on what source you read, it is projected that there is anywhere from 40 to 200 companies in the LAN marketplace.

The LAN vendors have utilized different mediums to build their products on. These are generally characterized into 4 categories: baseband coax, broadband coax, twisted pair wire and 16 wire flat cable. Further, the LAN vendors have adopted several topologies, linear bus, ring and star as well as different access methods, two popular examples being carrier sense multiple access with collision detection and token passing.

CABLE TELEVISION

Cable T.V. is the distribution of radio frequency television signals to subscribers' T.V. sets via a cable or optical fiber instead of over the air. The strength of T.V. broadcast signals diminishes as the distance increases. Since signals travel in straight paths, they lose clarity when they meet immovable objects such as mountains and tall buildings. Conversely, signals distributed over cable T.V. reach the viewer with the same picture quality as seen at the point of origin.

Cable T.V. systems obtain their programming through large antennas constructed on high ground. The antennas pick up signals off the air, on microwave, or by satellite relays. These are transmitted to a special "dead-end" site, where electronic equipment processes the signals for transmission into homes wired for cable. Many systems now offer between 12 and 24 channels, but technology already exists to push the capacity to well over 100.

APPENDIX H

APPENDIX

Canadian Experience 1960-1980

Project Title

- o Baffin zone telemedicine program. (2 projects)
- o Home centres videotaped counselling program for parents with hearing impaired children (0-5 years of age) in rural Newfoundland and Labrador.
- o Interactive Telehealth Project.
- o La Telemedicine au Quebec: Liaison entre le complexe La Grande et Montreal par le Satellite Anik-B. (2 experiments)
- o Memorial University of Newfoundland Teleconference System.
- o Memorial University Telemedicine Project. (2 projects)
- o Moose Factory Telemedicine Program.
- o University of Toronto/University of Waterloo Telemedicine Research Program.

Canadian Experience 1981 - Present

Project

- o Toronto General Hospital - Telidon Drug Information
- o L'institut de Recherche de Montreal - Telidon in Pshychiatric research.
- o The Metropolitan Toronto Hospital Council - General Hospital Information - Telidon
- o Toronto Institute of Medical Technology - computer assisted learning - videotex.
- o The Saskatoon Association of Rehabilitation Centres - Patient Information service - Telidon.
- o The Bureau de Coordination - Telidon Information transfer.
- o Canadian Hospital Association - health information service - Telidon.
- o The Knowledge Network - Health/Medical Education.
- o University of British Columbia - remote diagnostic.

- o Clarke Institute, Thunder Bay - MGS Satellite link
- o Memorial University of Newfoundland Teleconference System
- o Royal College of Physician and Surgeons and The Toronto General Hospital Teleconferencing System.
- o Interactive Telehealth Project - University Hospital, Woodstock
- o Manitoba Health Organizations Inc. - Data Network.
- o University Western Ontario, Sudbury, North Bay - Satellite Project

International Experience 1950 - Present

Project Title

- o University of Nebraska/Nebraska Psychiatric Institute (NPI)
- o University of Nebraska/Norfolk
- o Massachusetts General Hospital (MGH)/Logan Airport
- o Dartmout Medical Center/Claremont General Hospital
- o Veterans Administration (VA) Network
- o MGH - Bedford (Massaschusetts) VA Hospital
- o Nursing Home Telemedicine Project
- o New Hampshire/Vermont Interactive Medical Television Network
- o Bethany/Garfield Community Health Care Network
- o Consultation and Education for Health Care Personnel in Isolated Areas
- o Blue Hill - Deer Isle Telemedicine Project
- o Cambridge Telemedicine Project
- o Case Western Reserve School of Medicine Anaesthesiology Project
- o Cook County Hospital, Department of Urology, Picturephone Network
- o Illinois Department of Mental Health Medical Center Complex/Community Mental Health Programme Picturephone Network
- o Lakeview Clinic Bi-directional Cable Television System
- o New Hampshire/Vermont Interactive Medical Television Network (INTERACT)

- o University of Nebraska Slow Scan Radiology Project
- o Miami-Dade County (Florida Correctional Institutions Telemedicine Project. "An Evaluation of the Impact of Communications Technology and Improved Medical Protocol on Health Care Delivery in Penal Institutions."
- o Ohio Valley Medical Microwave Television System (joint project of Ohio ETV Network Commission and Ohio Valley Health Services Foundation, Columbus, Ohio).
- o Puerto Rico Telemedicine Project
- o Playas Lake Telehealth System
- o STARPAHC (Space Technology Applied to Rural Papago Advanced Health Care)
- o WAMI (Washington, Alaska, Montana, Idaho) Experiment in Regional Medical Education
- o VA Satellite Experiment
- o Alaska Health Experiment

DATE	PROJECT TITLE	GEOGRAPHY	FUNDING	TECHNOLOGY	TRANS-MISSION MODES	USER APPLICATION	COMMENTS
1982 (2 months)	University Western Ontario, Sudbury, North Bay	Ontario	Ministry of Health/Ministry of Government Services	Satellite	Video/ Audio	Counselling Consultation Psychiatry Speech Pathology	Well received
	The Knowledge Network	British Columbia	Ministry of Education, Science and Technology	CCTV Satellite Microwave	Video/ Audio	Continuing Education	
	University of British Columbia	British Columbia		Landline	Audio - Slow Scan TV	Remote Diagnostic	
	Clarke Institute	Ontario Toronto - Thunder Bay	Ministry of Government Services	Satellite	Video Audio	Counselling Psychiatry	
	Royal College of Physician and Surgeons and Toronto General Hospital Teleconference System	Ontario/ National	User Fee	Landline	Audio	Containing Education	Growing in usag

DATE	PROJECT TITLE	GEOGRAPHY	FUNDING	TECHNOLOGY	TRANS-MISSION MODES	USER APPLICATION	COMMENTS
1982	Toronto Institute of Medical Technology	Toronto		Telidon (videotex)	Data (text)	Computer Assisted Learning	
1982	The Saskatchewan Association of Rehabilitation Centres	Saskatchewan		Telidon	Data (text)	Patient Information	
1982	The Bureau de Coordination	Montreal		Telidon	Data (text)		
1982	Canadian Hospital Association			Telidon	Data (text)	Health Information	
1980	Manitoba Health Organization Inc.	Manitoba		Specialized Carrier	Data (text)	Administration/ Research	

DATE	PROJECT TITLE	GEOGRAPHY	FUNDING	TECHNOLOGY	TRANS-MISSION MODES	USER APPLICATION	COMMENTS
1976-1977	Baffin Zone Telemedicine Program 2 Projects	Baffin Zone	1. Health & Welfare DOC 2. Health & Welfare Bell Canada	HF Radio Satellite	Audio Audio/ Facsimile	Telecommunication Research	1. Established need for reliable telephone service. 2. Party Line. Technical difficulties.
1977-1978	Home Centred Video-taped Counselling Program for Parents of Hearing Impaired Children (0-5 years of age) in Rural Newfoundland and Labrador	Newfoundland Labrador	Health & Welfare Ivey Fund Windsor Foundation	Videotape Landlines	Audio Video	Counselling	
1980-Present	Interactive Telehealth Project	Southern Ontario London/	Ministry of Health/ Ministry of Gov't Services Ontario	Microwave	Video/ Audio	Continuing Education Consultation	Well received. Expanding - locally in London plus Sarnia
1979-1980	La Telemedicine au Quebec: Liaison entre de complexe La Grande et Montreal par le Satellite Anik-B 2 projects	Quebec	Supply & Services Canada - via Health & Welfare; James Bay Energy Corporation via La Grande Riviere Hospitals Fed. & Que. DOC, Que. Social Affairs Dept., Dept. of Education	Satellite	Video/ Audio with SSTV	Teleradiology Consultation Education Secondary Education	Numerous problems. SSTV didn't succeed because of poor quality transmission facilities. Numerous management problems
1979-Present	Memorial University of Newfoundland Teleconference System	Newfoundland	Supply & Services from Health & Welfare Self-funded	Landline (Darone Bridge)	Audio	Continuing Education Administration Teaching EEG's	Highly used accepted.

APPENDIX I

AMA/NET

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AMA ADDS CLINICAL LITERATURE BASE TO AMA/NET

CHICAGO -- The American Medical Association today announced an agreement with Excerpta Medica for a clinical literature data base for AMA/NET, the data base service of GTE Telenet's MINET medical information network.

The new data base has been designed especially for physicians by Excerpta Medica, the Medical Database Publishing Division of Elsevier Science Publishers of Amsterdam, Holland. Called Excerpta Medica Physician Information Retrieval and Education Service (EMPIRES), the literature base covers 298 key medical journals and is coded by medical specialty according to AMA Classification Codes.

"The addition of EMPIRES to AMA/NET is a major step in rounding out the physician's electronic library," says James H. Sammons, M.D., executive vice president of the AMA. "We expect EMPIRES to be one of the most popular and useful features of the medical information network."

EMPIRES will provide a "current awareness" and "retrospective searching" facility, so that articles can be searched according to date of publication and/or specialty area and are cross-referenced to other medical journals. The data base offers

a quick turnaround time from date of publication to entry into the network (about 8 to 12 weeks) and provides abstracts for most citations. More historical citations and abstracts will be added to the data base over time.

EMPIRES will be on-line by midsummer 1983. The data base will be updated at regular intervals with about 50,000 new citations and abstracts yearly. In addition, each record will contain a number of elements of information, such as full bibliographic details on the published articles, a subject area classification and various indexing terms, including drug terminology and drug manufacturers. The data base will also include a dictionary facility for physicians to check terminology and spelling or to browse for ideas for further searching.

In addition, the AMA plans to make available a service that will enable physicians to order full texts of cited articles from the AMA library. This service would extend to the socioeconomic bibliographic base as well.

**

The GTE Telenet Medical Information Network, consisting of AMA/NET data bases and MED/MAIL electronic mail service, was created by the American Medical Association and GTE Telenet Communications Corp. and made available to physicians and other health care professionals in late 1982. At present AMA/NET has four data bases on-line, containing information on drugs, disease, terminology and socioeconomic literature. The Association is looking into new services for the network that would provide information on laboratory results, diagnostic assistance and drug and disease alerts.

#

May 26, 1983

A Service of the
GTE Telenet Medical Information Network
and the American Medical Association

Drug Information

Overview

The Drug Information base (Copyright 1982, American Medical Association) contains evaluative, up-to-date and unbiased information on the clinical use of drugs. More than 1100 individual drug preparations marketed under some 5000 trade names in the United States, Canada and Mexico are described in detail. Users will not only be able to obtain comprehensive information for each drug by name but will be able to identify drugs according to indications for therapy, special patient circumstances, or for certain drug actions and interactions.

Intended Uses

This information base is of value for physicians in both general and specialty practices, as well as for pharmacists, registered nurses, clinical and administrative support personnel, and other allied health care professionals.

Producer

Division of Drugs
American Medical Association
Chicago, Illinois

The Drug Information base is produced under the editorial direction of AMA scientific staff and external consulting experts and is subject to strict editorial controls.

Reference

American Medical Association. *AMA Drug Evaluations,* 5th edition, 1983. The electronic version has been expanded with more specific information for prescription of drugs, including availability of specific preparations, dosages and trade names.

Frequency of Updates

One-twelfth of the information base is routinely updated each month. Critical additions and revisions are made immediately.

Notes

1. A $25.00 credit applies if one registered user within a subscriber organization is an AMA member.
2. Applies to calls made through Telenet network exchanges, which are located in 250 cities in the continental United States.
3. Prime time hours are: 7:00 A.M.–6:00 P.M., local time Monday through Friday
4. Non-prime time hours are: 6:00 P.M.–7:00 A.M., local time Monday through Friday

   All day, Saturday and Sunday

   All day, major holidays
5. Storage units consist of 2000 characters and are computed on a per message basis. There is no charge for the first five days of storage after a message is posted, read or delivered.
6. Includes all changes to be made in a single subscriber or user profile, provided these changes are contained in an authorized request to the Medical Information Network administrator.

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GTE

A/NET

A Service of the
GTE Telenet Medical Information Network
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Disease Information

Overview

The Disease Information base (Copyright 1982, American Medical Association) contains current, succinct descriptions of diseases, disorders and conditions. The important diagnostic features of more than 3500 identifiable diseases are summarized in a systematic manner, using preferred standard terminology. The disease base is organized in such a way that users can request information on a specific disease in its entirety or for certain subtopics under the disease listing.

Intended Uses

The disease base is designed as a quick reference tool for physicians in general practice when they are making or confirming a diagnosis, and for specialists in areas outside their immediate specialities. It is also useful for clinical reporting and recording. As an educational tool, it will be of interest to many other groups associated with the medical profession.

Producer

Department of Medical Terminology and Nomenclature
American Medical Association
Chicago, Illinois

The Disease Information base is produced under the editorial direction of AMA scientific staff and external consulting experts and is subject to strict editorial controls.

Reference

American Medical Association. *Current Medical Information and Terminology,* 5th edition, 1981.

Frequency of Updates

Twice yearly.

MED / MAIL Features
(Continued)

Electronic Forms.
Most standard forms and report formats can be duplicated electronically within the MED/MAIL system so that the originator need only fill in the required information. This special feature can be used for reporting laboratory results directly to the attending physician, for ordering supplies, for submitting administrative reports and for many other types of similar applications. Assistance in developing electronic formats for specific applications is available from the GTE Telenet staff.

Special Medical Services Via MED / MAIL

Document Order Service.
Subscribers can quickly order article reprints and reports referenced in the network's bibliographic information services directly from the AMA Library via MED/MAIL.

CME Information.
Detailed information on Continuing Medical Education activities is available through a CME electronic bulletin board.

AMA Meeting Information.
An electronic bulletin board maintained by the American Medical Association contains current and detailed information on future AMA conferences and seminars.

A number of other communications services of special interest to the medical community will be available in the near future.

For Additional Information

MED/MAIL electronic mail is part of a comprehensive set of information and communications services designed for the medical professional and available through the GTE Telenet Medical Information Network.

For further information on this or other services, please contact your local GTE Telenet medical representative or:

GTE Telenet Medical Information Network
8229 Boone Boulevard
Vienna, Virginia 22180

Telephone: 703/442-2500

GTE Telenet Communications

GTE

A Service of the
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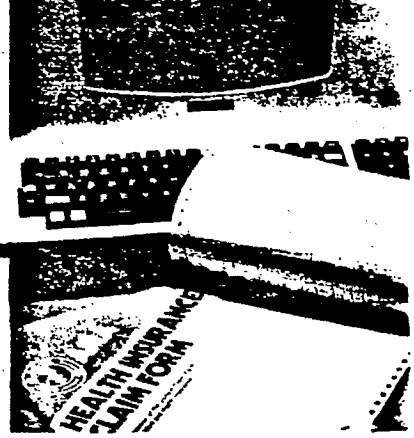

Medical Procedure Coding & Nomenclature

(CPT System)

Overview

The Medical Procedure Coding and Nomenclature information base (Copyright 1982, American Medical Association) provides a uniform coding and nomenclature system for reporting medical services and procedures performed by physicians. It contains more than 6000 descriptions of procedures with their identifying codes in the areas of medicine, surgery and diagnostic services. Derived from the AMA publication, *Physicians' Current Procedural Terminology* (CPT), it is the most widely used of all systems for reporting and communications with third party payers.

Intended Uses

The electronic version of the CPT system is designed to be used by practicing physicians and third party payers as a reliable and accurate means of reporting medical services and procedures. As a uniform nationwide communications system, it can serve as a basis for local, regional and nationwide utilization and comparison, and as such, will be of value to medical societies, specialty groups, government agencies, medical schools, hospitals and clinics.

Producer

Department of Medical Terminology and Nomenclature
American Medical Association
Chicago, Illinois

The Medical Procedure Coding & Nomenclature information base is produced under the editorial direction of AMA scientific staff and external consulting experts and is subject to strict editorial controls.

Reference

American Medical Association. *Physicians' Current Procedural Terminology*, 4th edition, 1981.

Frequency of Updates

Twice yearly.

Information Categories

Each citation contains the following categories of information:

- Author*
- Title*
- Subject*
- Source*
- Date*
- Collation
- Document Number

Information Access

Users can search for articles by subject, title or author, just as they would in a traditional periodical reference guide, or by any of the other categories starred (*) above. There are comprehensive electronic indexes to assist in a search.

For example, if a physician were interested in articles which discuss malpractice premiums or technology and the cost of medical care, he would simply enter one or more appropriate subject words. The system will then locate all relevant citations for him.

Unlike a traditional periodical index, however, searches can be easily narrowed to, for example, citations on malpractice premiums appearing after or between certain dates, from a designated journal or by a specific author. Computer technology also makes it possible to scan for certain subject words not only in the subject headings but also in the title/abstract in order to locate every possible reference to a specific topic.

Document Delivery

Documents may be ordered on line from the AMA's Division of Library and Archival Services through MED/MAIL, the electronic mail service of the GTE Telenet Medical Information Network.

For Additional Information

The AMA/NET Socio/Economic Bibliographic Information base is part of a comprehensive set of information and communications services designed for the medical professional and available through the GTE Telenet Medical Information Network.

For further information on this or other services, please contact your local GTE Telenet medical representative or:

GTE Telenet Medical Information Network
8229 Boone Boulevard
Vienna, Virginia 22180

Telephone: 703/442-2500

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and the American Medical Association

Socio / Economic Bibliographic Information

Overview

The Socio/Economic Bibliographic Information base (Copyright 1982, American Medical Association) serves as a guide for locating current articles on the non-clinical aspects of health care. More than 700 journals are monitored on a continuing basis, making this the most comprehensive bibliographic resource of its kind. Other sources include legislative reports, books and selected newspapers.

The following subject areas are covered, among others, as they relate to health care and health care providers:

- Economics
- Education
- Ethics
- International Relations
- Legislation
- Medical Practice
- Political Science
- Psychology
- Public Health
- Sociology
- Statistics

Intended Uses

Documents indexed in this bibliographic information base provide background material for speeches, articles, reports and media presentations and will be of use to many groups in the medical and health care professions. Of specific interest to practicing physicians are citations to current literature in such areas as cost containment, medical staff relations, insurance reimbursement, legislative initiatives, practice management and the role of the profession in today's society.

Producer

Division of Library and Archival Services
American Medical Association
Chicago, Illinois

The Socio/Economic Bibliographic Information base is produced under the editorial direction of AMA scientific staff and external consulting experts and is subject to strict editorial controls.

Reference

Socio-economic current awareness citations and abstracts were published by the AMA in print form from 1962 through 1979 and were originally known as *Socioeconomic Research Resources* (MEDSOC). The current file is only available on line.

Inclusive Dates 1981—present **Frequency of Updates** Monthly

Information Categories

Procedure listings are available by:

- Procedure Name*
- Procedure Code Number*
- Procedure Section Headings*

  These include the major medical specialty sections with anatomic, procedure, conditions and/or description sub-headings.

Information Access

Information can be quickly retrieved on a group of related procedures by entering the procedure name, procedure code or by searching any other relevant section heading starred (*) above. There are comprehensive electronic indexes to assist users in their searches. Guidelines and notes for procedure categories will assist in the understanding of their contents. Cross references to other procedure groups are included to ensure accurate code selection.

For Additional Information

The AMA/NET Medical Procedure Coding and Nomenclature information base is part of a comprehensive set of information and communications services designed for the medical professional and available through the GTE Telenet Medical Information Network.

For further information on this or other services, please contact your local GTE Telenet medical representative or:

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GTE Telenet Communications

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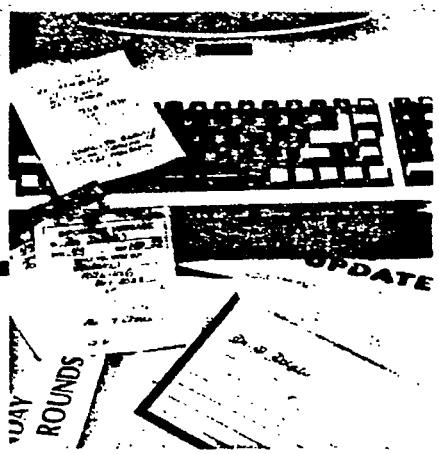
MED / MAIL℠



A Service of the
GTE Telenet Medical Information Network

Overview

MED/MAIL℠ electronic mail provides a fast and reliable means of communication within the medical and health care community. Subscribers can read, send and even file messages electronically, using a computer terminal. Once a message is sent, it is immediately deposited into the recipient's electronic mail box where it can be read at his or her convenience 24 hours a day from any city in the United States. More than a person-to-person message service, MED/MAIL also serves as a central source of information on Continuing Medical Education activities, AMA meetings and for many other services offered through the GTE Telenet Medical Information Network. Easy to learn and use, MED/MAIL incorporates many time-saving features for the busy professional.

Intended Uses

MED/MAIL service is designed as a universal communications system, available to all users of the GTE Telenet Medical Information Network. It is ideally suited for communications within and between medical practices, hospitals and clinics, and professional societies and for communicating with other organizations such as suppliers and third party payers.

MED / MAIL Features

Information Retention.
Incoming and outgoing messages can be filed electronically within the MED/MAIL system for an unlimited period of time and instantly retrieved when needed. Information appearing in network information bases can also be transferred to any subscriber's electronic mail box for future reference and/or transmission to other health care professionals.

Group Lists.
Subscriber organizations can establish special group lists within MED/MAIL to speed personal addressing and distribution of widely-disseminated messages.

Bulletin Boards.
Messages of general interest can be posted on electronic bulletin boards where anyone authorized to read them may do so at his or her convenience.

Information Categories

Each disease listing contains the following categories of information:

- Nomenclature* (including disease name)
- Etiology
- Signs and Symptoms
- Clinical Findings
- Radiological Findings
- Disease Course
- Pathological Findings

Information Access

By referencing a disease by name, users can quickly retrieve a full summary of the disease or select specific categories of information about the disease.

The "nomenclature" category also has a comprehensive electronic index to aid in a search. That is, users can obtain a listing of all diseases that include a specific term in their titles, such as all disease names containing the term "pneumonia."

In addition, a comprehensive electronic index is available for terms contained in all combined categories of the disease information base. This index may be used to assist in locating a specific disease, for example, by entering a particular sign, symptom, or laboratory finding in the "all" index.

For Additional Information

The AMA/NET Disease Information base is part of a comprehensive set of information and communications services designed for the medical professional and available through the GTE Telenet Medical Information Network.

For further information on this or other services, please contact your local GTE Telenet medical representative or:

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8229 Boone Boulevard
Vienna, Virginia 22180

Telephone: 703/442-2500

GTE Telenet Communications

GTE

Rate Schedule

Effective March 1, 1983

GTE Telenet Medical Information Network

I. Subscription Fee	Payable on a one-time basis by the group or individual contracting for service. Includes one individual user registration and one set of instruction materials.	$100.00[1]
II. User Registration Fee	Payable on a one-time basis for each individual user within a subscriber organization.	$25.00/User
III. Usage Charges[2]	**AMA/NET℠ Information Services**	
	Disease Information (DISEASE)	$26.00/Hour
	Drug Information (DRUG)	27.00/Hour
	Medical Procedure Coding & Nomenclature (CPT)	25.00/Hour
	Socio/Economic Bibliographic Information (SIB)	25.00/Hour
	MED/MAIL℠ Communications Services	
	Connection time	
	Prime time[3]	$16.00/Hour
	Non-prime time[4]	7.00/Hour
	Multiple address delivery	.05/Addressee
	Storage	.01/Day/Unit[5]
	Other Usage Charges	
	Includes usage of the Medical Information Network when the user is not connected to a specific information or communications service.	$16.00/Hour
IV. Monthly Minimum Charge for Usage	There is a monthly minimum usage charge based on the number of registered users within each subscriber organization.	
	First User	$ 45.00
	Second through eleventh user	25.00 each
	Eleven or more users	295.00 per subscriber organization
V. Instruction Materials		$15.00/Set
VI. Subscriber or User Profile Changes[6]		$15.00/Each

Information Categories

Each drug listing contains the following information categories:

- Summary
- Nomenclature*
- Uses*
- Actions*
- Pharmacokinetics
- Adverse Reactions*
- Toxicity*
- Precautions*
- Interactions*
- Dosages/Routes/Administration*
  - Oral
  - Intramuscular
  - Intravenous
  - Topical
  - Other
- Preparations
- References
- Patient Medication Instructions

Simple Keyword Searches

Information on a specific drug can be retrieved in its entirety or by category, making it easy to isolate information in a short time. Users can look up an individual drug by its generic or trade name, or search by any of the other categories starred (*) above.

Each of the starred categories also has a comprehensive electronic index to aid in a search. That is, through the "uses" index, a physician can request a listing of drugs which are used for a specific purpose, such as drugs used in treating asthma, rheumatoid arthritis, or cardiovascular disease.

Similarly, the "actions" index helps locate drugs which work in a specific way, for example, bronchodilator drugs, diuretics, topical anesthetics, etc.

A category of special interest is "drug interactions." While this area of information is relatively new in the literature, it is expanding rapidly.

Advanced Keyword Searches

The speed and intelligence of the computer make it possible to perform even more complex and productive searches. By searching with certain keywords, it is possible, for example, to find a drug used for asthma that does not cause tachycardia or one used for heart failure that is not a diuretic. Or, if a patient has a fever and is intolerant to aspirin, it is possible to find a drug used for fever which is not a salicylate. Keyword searches such as these can provide many shortcuts in locating specific drugs for specific purposes.

For Additional Information

The AMA/NET Drug Information base is part of a comprehensive set of information and communications services designed for the medical professional and available through the GTE Telenet Medical Information Network.

For further information on this or other services, please contact your local GTE Telenet medical representative or:

GTE Telenet Communications

GTE

GTE Telenet Medical Information Network
8229 Boone Boulevard
Vienna, Virginia 22180

Telephone: 703/442-2500

APPENDIX J

iNet 2000

The **iNet 2000**™ Gateway is an intelligent network concept developed by the member companies of the TransCanada Telephone System (TCTS). This concept has evolved in recognition of the requirement for more universal accessibility to online information and other computer-based services.

The **iNet** 2000 Gateway offers a single point of access to satisfy all business information needs. A wide range of features, such as an electronic directory of available services, automatic access to connected hosts, integrated electronic messaging, individual user profiles recognized by the network and consolidated billing create a user-oriented information environment.

iNet 2000 can be entered from virtually any location in the country. Standard alpha-numeric or Telidon videotex terminals can gain access via **Datapac**™, DDD, or dedicated circuit service. Moreover, since the service has access to **Datapac**, it can link to packet switched networks in the United States and other international packet switched networks.

The **iNet** 2000 Gateway is designed to simplify the process of gathering, using and communicating information. It will offer a full shopping list of vendors and information, eliminating the need for the user to perform many administrative functions.

And since the network recognizes the individual user, its operation can be tailored to suit specific needs and levels of expertise. This will be an important feature, especially to the novice user.

Managers, executives, salespeople or anyone else requiring simple but effective access to information can make the connection with TCTS' **iNet** 2000 Gateway service.

A one-year field trial of this concept was launched in the Canadian marketplace July 12, 1982. And starting in mid-1983, a market trial — to last 12 to 18 months — is being held across Canada with enhanced functionalities and an expanded user and information provider base.

Features

Accessibility

Users can address the **iNet** 2000 Gateway through:

- **Datapac**
- dedicated circuit service
- public switched telephone network

Terminal Support

The **iNet** 2000 Gateway supports a wide range of standard ASCII and Telidon videotex terminals.

Directories

Three types of directories are offered: public, organization, and personal.

- Directories contain category listings, and the details on each service available. The public and organization directories provide additional details about each service which might be of interest to users prior to connecting to the respective services.
- The public directory provides **iNet** 2000 subscribers with a consolidated listing of all publicly-available online services which can be accessed through the **iNet** 2000 Gateway.
- The organization directory provides a complete list of all services available to the common interest group, as defined by that group. The list can be shared on an inter- or intra-company basis.
- The personal directory typically contains a listing of services which an individual **iNet** 2000 subscriber would call on a frequent basis.
- Directories provide automatic access to the listed information service.
- Directories can also provide automatic "extended access" to specific database information.

Access

- A user signs on to the network only once per session.
- Access to other hosts through the **iNet** 2000 Gateway is performed automatically when a directory item is chosen.
- No further identification is required, since the network intelligence stores the user's profile, password and account codes.

System Administration

- System messages, such as system downtime, are presented to the user after signing on.
- Administrative support information, such as help systems, hours of operation and operating instructions, are available to the user.
- ICTS system administrators will create and update user profiles and directories, and provide general user support.

System Management

Provides an overall system monitoring capability.

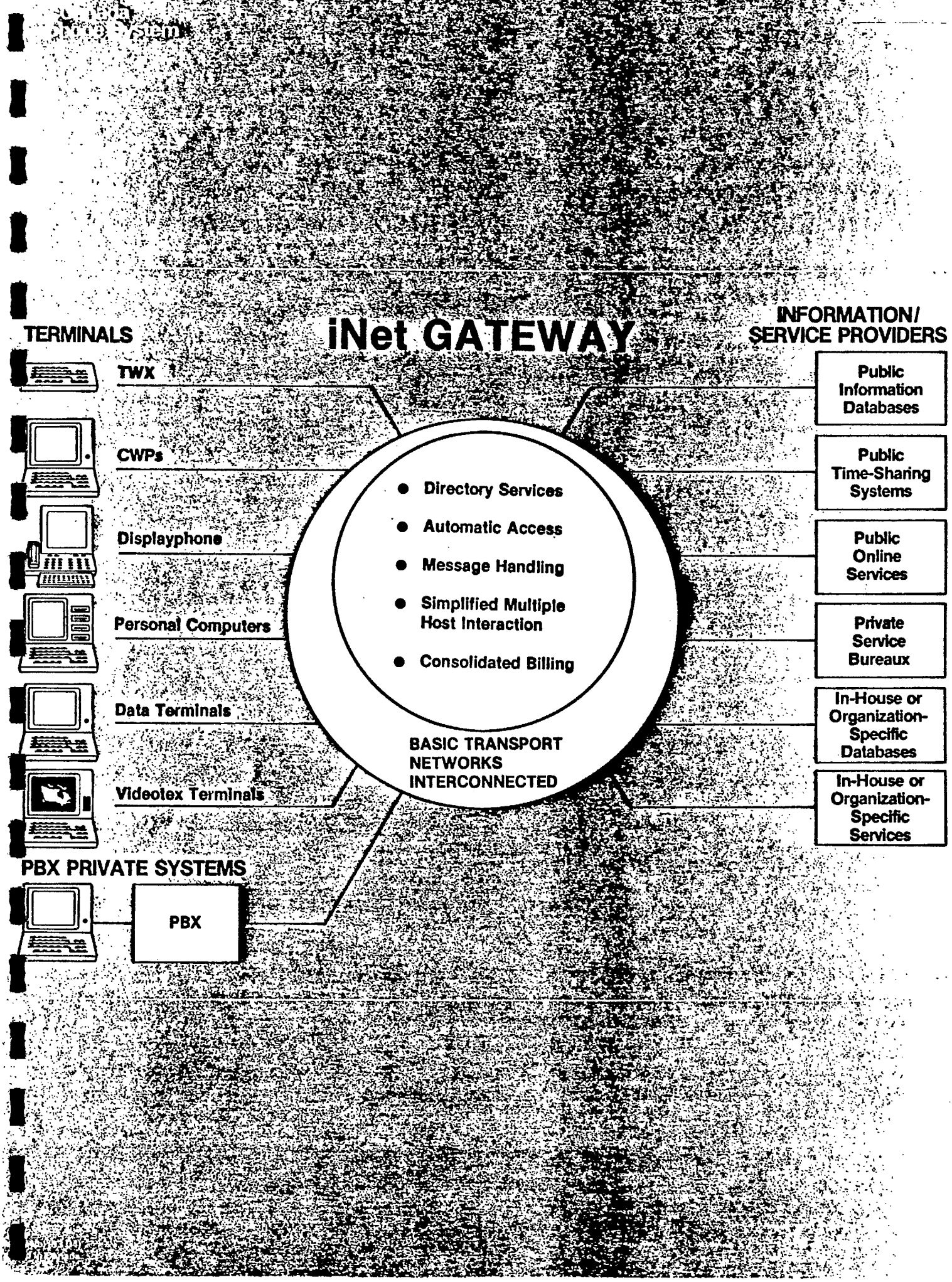
- Identifies and disconnects malfunctioning terminals and hosts. Notification is provided to users and operators in the event of disconnection.
- Provides statistical information for billing and traffic studies.

Full Messaging Capability

- The **iNet** 2000 Gateway provides full messaging service to users, including those employing Telidon terminals.

Profile

- Each user is recognized by the network as a unique individual through a discrete user profile.
- The profile defines how the user will interact with the system with respect to language, level of expertise, level of authority, billing requirements and other user-specified parameters such as the type of terminal (ASCII or Telidon).


TERMINALS
iNet GATEWAY
INFORMATION/
SERVICE PROVIDERS
TWX
CWPs
Displayphone
Personal Computers
Data Terminals
Videotex Terminals
PBX PRIVATE SYSTEMS
PBX
Directory Services
Automatic Access
Message Handling
Simplified Multiple Host Interaction
Consolidated Billing
BASIC TRANSPORT NETWORKS INTERCONNECTED
Public Information Databases
Public Time-Sharing Systems
Public Online Services
Private Service Bureaux
In-House or Organization-Specific Databases
In-House or Organization-Specific Services

iNet
User Benefits

A truly innovative communications and information tool, **iNet**™ brings a wide range of benefits to its users:

Improved Productivity. You can take advantage of a number of features which allow you to use your time to the greatest advantage.

- You only log-on once. After the initial access to **iNet** is made, all the databases and services available through **iNet** are accessed via directories, or menus. There is no longer a need to labour through the complicated log-on procedures for different services to get to all the information you need.
- The extended access feature makes it easy to locate information you need on a regular basis. In other words, if you need to know stock quotations, or obtain news clippings relating to your organization and other organizational information such as inventory and sales results on a daily basis, **iNet**'s extended access feature allows you to gain direct access to that information at the directory level. You do not have to enter the various passwords and search commands. You just enter the number associated with the item in your personal or organizational directory, and the information appears on your screen.

By saving you numerous log-on sessions and long and costly searches for the information that is crucial to you, **iNet** helps you make the most effective use of your time, and thus helps boost your productivity and effectiveness.

Timeliness. iNet provides access to online databases which contain information not available in print, such as news clipping services, up-to-date stock market status reports, special newsletters, and timely travel information, to name only a few. So **iNet** gives you that extra information edge you need to stay on top that would be impossible to achieve using traditional print media.

One-Stop Shopping. iNet puts an end to the "hit-and-miss" method of finding information that wastes so much time and money. **iNet**'s public directory is updated on a regular basis to let you know exactly what information is available and where to find it.

Not only do you save time by locating the information quickly, but with **iNet**, you find it all in one place — at your fingertips. So locating information using **iNet** is more manageable, leaving you more time to spend making better decisions and working on those projects that so often have to fall to the wayside because the day is too short.

In addition, **iNet** saves you the trouble of subscribing to each service separately. TCTS makes all the necessary arrangements with the public information or service providers on **iNet**.

Terminal Flexibility. iNet's directories, user interface and terminal support have been designed to allow a wide range of standard ASCII and Telidon terminals to use the system. **iNet** allows subscribers using standard ASCII terminals to access information in either format. Telidon pages containing graphics can be presented on ASCII terminals using a "graphic stripping" technique, so that only the textual information appears.

Consolidated Billing. With **iNet**, you get only one consolidated bill, which includes **iNet** charges and any charges relating to the use of one of the system's public services. You no longer have to carry the administrative burden associated with settling bills for a number of different services.

Operation According to Level of Expertise. Whether you are new to **iNet** or an expert, you can use the system according to your level of expertise. Novice users have the option of being guided through the various steps and proceeding at their own rate. Experienced users can interact with the system through short form commands and shorter system prompts.

How to Become an Information Service Provider

If you would like to be an **iNet** 2000 service provider, we will immediately assign one of our service provider consultants to you. This person's responsibility will be to work with you to ensure that the implementation process is as easy as possible. The activities this will involve include:

1. Contractual Arrangements

As a telecommunications carrier, it is necessary that we, along with the user and service provider, be aware of our relative roles and responsibilities and agree to certain terms and conditions.

2. Access Procedure Information

In order to develop the appropriate system access procedures to connect your host to the **iNet** 2000 service, we will need to confirm such things as host database characteristics, host call set-up, log-on and log-off procedures, and hardware and software descriptions.

3. Directory Details Information

Of critical importance will be the way in which your service is listed in our online national directory. These details include such things as the service names, cost, hours of operation, and short descriptions of the database content. With this information, we will be able to determine the appropriate subject categories in which your service should be listed to allow you to more accurately focus on your target markets.

4. Accounts Receivable Management

By participating in our accounts receivable management program, you will be able to assign to us at a discount all of your accounts receivable for **iNet** 2000 users. You will be paid within 30 days, and we will handle all of the user billing and collections activities. We will also assume all responsibility for bad debt and late payment problems. The service provider consultant will be able to provide assistance in determining the most appropriate way to make this service available to your users who want **iNet** 2000 service.

If you would like to learn more about the advantages of becoming an **iNet** 2000 service provider, please call Gaye Clemson, **iNet** 2000 Product Manager, at (613) 239-5430.

iNet 2000

Information Service Provider Benefits

iNet 2000™ offers a number of benefits to you as a provider of databases or computer-based services, ranging from reducing your administrative overhead to providing an effective means of gaining customers, in both the new, casual-user marketplace, and in your existing market environment.

Target Marketing

iNet 2000 allows you to reach the markets for which your databases and services were designed. **iNet** 2000's detailed directories allow subscribers to gain direct access to the right source and provide you with the opportunity to advertise specific databases and services.

Effective Promotion

In addition to the cost-effective promotion available in the **iNet** 2000 directory, you receive additional exposure through your association with **iNet** 2000 and the member companies of the TransCanada Telephone System (TCTS). You benefit from public announcements and publications related to **iNet** 2000, in which mention of your organization is included. This increased exposure can lead to increased business opportunities, both inside and outside the **iNet** 2000 environment.

Reducing Your Administrative Overhead

Billing. You no longer have to issue bills to subscribers of your services. You are paid directly by TCTS once we have received the billing information from you. We take care of the rest — billing subscribers, bad debt management and overdue account follow-up. So your billing cycle will improve significantly and support of the casual-user market will become more cost-effective.

User Accreditation. You no longer have to deal with subscribers on an individual basis. We handle all accreditation of subscribers who use your services via **iNet** 2000. So **iNet** 2000 allows you to concentrate on service to your customers, rather than on administrative functions.

iNet 2000 increases the usage of your services, providing increased revenues as a result. It reduces your operating costs by streamlining your administrative operations, and improves your cash flow because you get paid as soon as we receive your billing information. In addition, **iNet** 2000 provides you with the opportunity to enter the potentially larger casual-user marketplace, traditionally considered prohibitive because of high administrative costs.

System

Market Trial Fact Sheet

Starting in July 1983, the TransCanada Telephone System (TCTS), will be conducting a one-year market trial of the iNet 2000™ concept.

Building upon the extensive findings from the one-year field trial — held in the Canadian marketplace since July 1982 — TCTS has enhanced iNet 2000 for the market trial to include a transaction capability, improved user interface and directory capabilities, and an online user guide.

Some of the planned enhancements for the market trial include system interworking and shared screen capability. TCTS believes that the market trial will provide the opportunity to test and even further refine these iNet 2000 service features.

Approximately 1,500 users, most of whom are located across Canada, with some users from the United States and abroad, are expected to participate in the market trial. Information and service providers from around the world will take part in the trial, representing key segments of the electronic information marketplace.

During this market trial, users and information service providers will be charged for using the service. A billing system will also be in place to provide combined billing to users for access to the various public information/service providers.

Concept Name:	iNet 2000™ Gateway
Intended Market:	Business segments and casual user market (managers, executives, professionals, home computer users)
Trial Developers:	TransCanada Telephone System (TCTS) in conjunction with Bell-Northern Research
Purpose of Trial:	The final step in assessing the market acceptance and economic viability of iNet 2000 as a nationwide service offering. Other objectives include: - further refinement of iNet 2000 features, so that the system will be more flexible and of use to a wider community of users, - and the implementation of service rates and a combined billing system.
Trial Start Date:	July 1983
Duration of Trial:	18 months
Prime Locations:	National, with a limited number of participants from the United States and abroad.
Trial Users:	1,500 users, with representatives from the public sector, private industry and the casual user segment.

June 1983

TransCanada
Telephone System

iNet Industry Fact Sheet

Applications in Health and Medicine

iNet^{TM}, an information and database gateway offered by the TransCanada Telephone system (TCTS), serves a wide range of applications in the fields of health and medicine, including:

- providing vital information for the prevention, diagnosing and treatment of diseases and illnesses.
- providing information and support in the areas of nursing, therapy, dietetics, prosthetics, pharmaceutics, prescription and fitting of eye glasses, dentistry and other specialized fields.
- providing research support for medical and health specialists as well as for more general audiences.

Information Specific to Health and Medicine

A wide range of health-related information is available through **iNet**, including:

- articles and research papers from worldwide journals and publications in the health sciences. Searches can be made by subject in many cases, and some of the material is available in a number of languages.
- an index to more than 3,500 biomedical journals from 70 countries, with abstracts provided for approximately 1,500 of these. Two fields -- dentistry and nursing -- feature their own index.
- a reference guide to material on the adverse effects of and poisoning caused by various drugs and by the interaction of chemicals and biological systems; information on the epidemiological effects of pesticides on humans; and trends and developments in pharmaceutics and chemical mutagenesis. References relate to human, animal and plant life.
- an index to material on all aspects of cancer, such as cancer therapy, cancer treatment, carcinogenesis, chemotherapy, chemical carcinogenesis, immunotherapy, physical carcinogenesis, radiotherapy, and viral carcinogenesis. References are from journals, conference proceedings, government reports, monographs, books and theses.

- original research reports in the areas of biology, biomedicine, pharmacology, psychiatry, public health, toxicology, veterinary science, and the history and philosophy of biological and biomedical sciences. Reviews of this material are also available. Original research material is obtained from more than 8,000 serial publications, as well as books, notes and symposia.

- an index to articles, meeting reports, letters, editorials, and correction notices, to name only a few examples, from 4,000 of the world's most influential scientific and technical journals, covering areas such as medicine, pharmacology, surgery and psychology.

- an index to articles and other material from more than 1,500 social science publications and journals. Items indexed include articles, letters to the editor and book reviews.

- reports of recent and current research (basic and applied) conducted in the United States in agriculture, behavioural sciences, biology, chemistry and chemical engineering, electronics, engineering, materials, mathematics, medicine, physics and social sciences. Information on research in progress is provided by more than 1,300 funding organizations, such as federal, state and local governments, non-profit associations, colleges and universities, non-affiliated organizations, and a limited number of organizations outside the United States.

- an index to information available relating to sports, sports medicine, recreation and physical education.

General Information

- a reference source to articles on business, economics, administrative studies and related fields from Canadian publications.

- a reference guide to key contacts in 30 major Canadian newspapers and popular magazines.

- online news coverage of national and worldwide events, from major news sources, such as Infloglobe (The Globe and Mail) and New York Times.

APPENDIX K

Teleconferencing Systems Guide

Published by
The Transportation Energy Management Program (TEMP)

Transportation Technology and Energy Division
Ontario Ministry of Transportation and Communications
Hon. James W. Snow, Minister
H.F. Gilbert, Deputy Minister

Ontario Ministry of Energy
Hon. Robert Welch, Q.C. Minister
G.R. Thompson, Deputy Minister

For comments or additional copies, write:
TEMP Teleconferencing Task Force
East Building
Ontario Ministry of Transportation and Communications
1201 Wilson Avenue
Downsview, Ontario
Canada M3M 1J8
(416) 248-3567

March 1983

published by

TEMP

Transportation Energy Management Program

Introduction

A wide range of teleconferencing systems is available to meet the needs of organizations. Once the feasibility of teleconferencing has been established, and organizational constraints have been identified, various system components must be chosen. This guide is designed to provide a brief introduction to the components of a teleconferencing system and to issues which should be considered in selecting them, and includes a list of known suppliers.

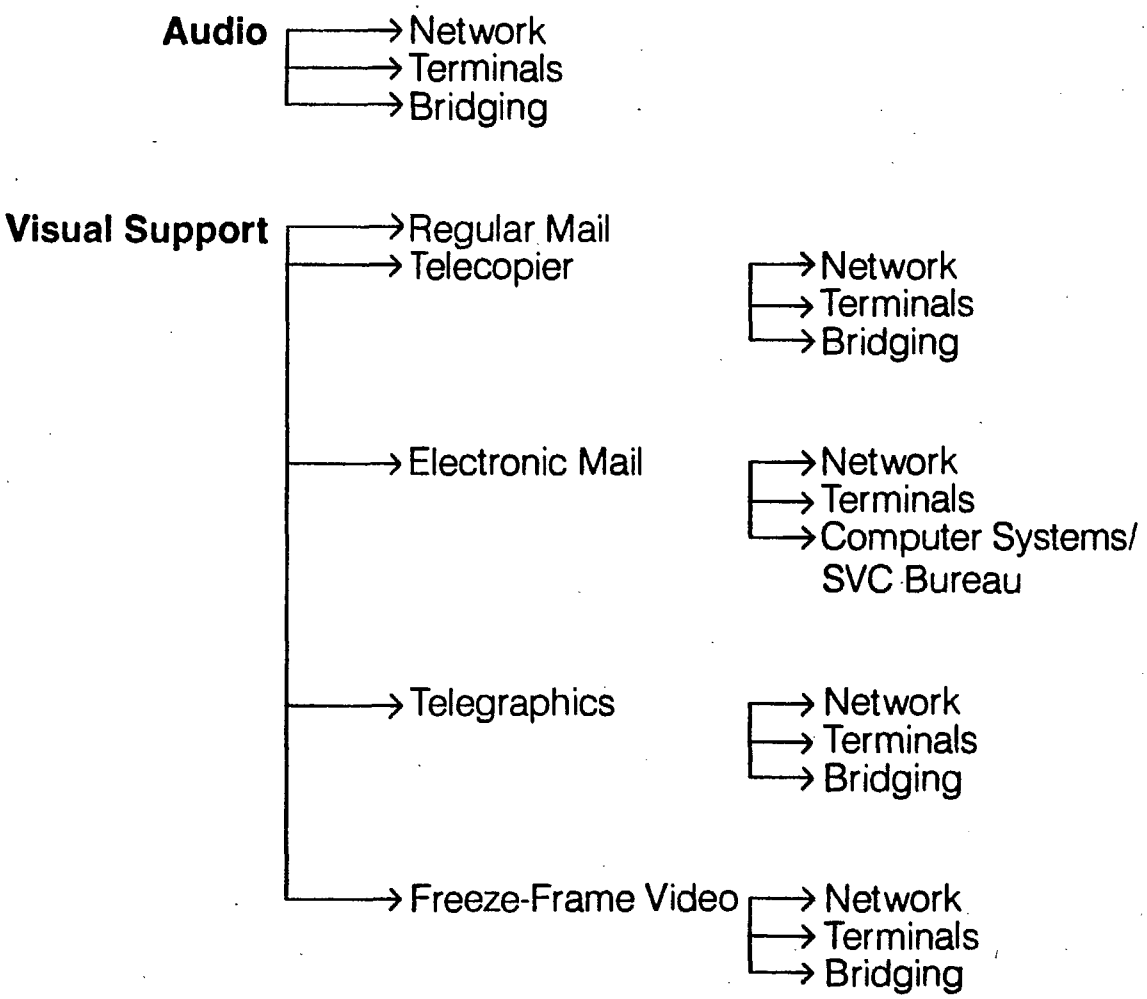
Audio alone? Audio plus visual support? Full Motion Video? Combination? The first general decision which must be made relates to the type of teleconferencing.

Studies have shown that audio conferencing can suffice for a large number of meetings, that the addition of visual support extends audio conferencing applications, and that full motion video conferencing adds even more. Audio conferencing is the least expensive, most universal and accessible form of teleconferencing – anyone with a telephone can be involved in multi-point or group conferences. Good audio is essential, regardless of what is added to it.

To support audio conferences, visuals can be mailed in advance. Where this is impractical, however, a variety of techniques can be used to support an audio conference, such as telecopiers or electronic mail to exchange documents, telewriting to exchange graphics, or freeze-frame (slow-scan) video to exchange still pictures of people, objects, or graphics. Many of these techniques use regular telephone lines so transmission costs are low. However, equipment can be expensive and different brands are not always compatible.

Finally, in some cases where there is a need to see motion and expressions, full motion or real-time video may be most appropriate. At present, real-time video is relatively expensive and works best two ways between two points or one way from one point to several others.

3/ Choose Components for Each System



CNCP Broadband Network

Broadband is a four-wire network which can also be used for data transmission. This system offers the advantages of four-wire or full-duplex audio teleconferencing without the high cost of a private network. Four-wire networks have two separate transmission paths, one for sending and one for receiving. This results in better audio quality and eliminates the need for voice-switching.

Private Network

A private or dedicated network can be installed between fixed locations to provide constant quality of service, but may be costly depending on projected frequency of use.

Audio Terminals

Audio terminals are the equipment used to speak and listen in a teleconference. They range from the telephone handset to a vast array of speaker/microphone units which accommodate groups at any location.

Considerations

Capacity – How Many People Per Location?

For a small group, a hands-free speakerphone may be sufficient. For larger groups, more sophisticated units may be required.

Features

- Voice-Switched
  Some terminal equipment is hands-free and uses voice-activated switching to prevent audio feedback and echoes. As a result, when a participant in one location is speaking, he or she can only be interrupted when a participant in another location speaks loudly enough to override his or her signal. Often a few syllables will be lost in the transition, but this problem is reduced as the speed of switching increases. (See Figure 2).
- Push-to-Talk
  Some equipment features a push-to-talk button which activates the microphone and cuts the loudspeaker. This feature minimizes the problems of feedback but makes the technology more intrusive than hands-free equipment.
- Open Audio (Full-Duplex)
  Some systems, generally those in an acoustically controlled environment using a four-wire network, have no voice-switching or push-to-talk features. If an open microphone is used under other conditions, the possibility of feedback is increased.

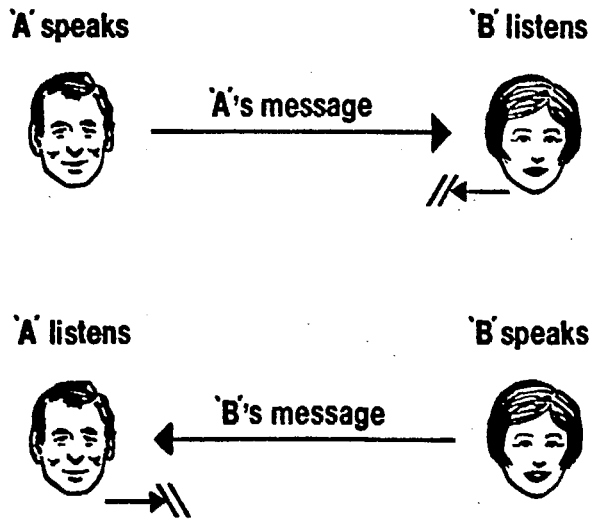
Cost: Rent or Buy

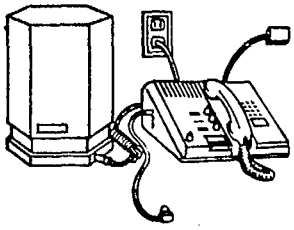
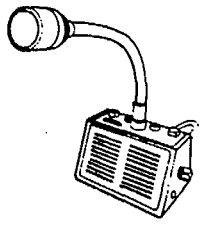
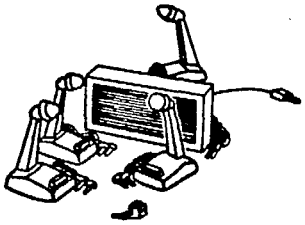
Prices for audio terminals vary considerably, from around $100 to over $3000 per location. Some may be leased; others must be purchased outright.

Portable or Permanent

Some audio terminals are portable and can be used with any standard telephone. Others must be specially installed.

Figure 2/ Voice-Switching on a 2-Wire Circuit



Name and Supplier or Manufacturer	2-Wire	4-Wire	Capacity	Characteristics	Approximate Price
Conference 2000 Northern Telecom *Figure* 3B 	X		medium to large	– Speaker/microphone cylinder adjunct to standard telephone – voice-switched – earphone allows chairman to monitor	Rent $50.55/mth. Buy – $1500
Phillips Conference System Rauland-Borg *Figure* 3C 	X		medium	– Push-to-talk speaker/microphone units coupled to standard telephone	
Darome Convener Darome Teleconferencing Division *Figure* 3D 	X		large	– Control box connects to standard telephone – Press-to-talk microphones – Portable 600 series models include one microphone, 1600 series includes 4 mikes	
	X			Model 610/1610* – voice-switched	Buy – $932/$1439 Rent – $76/$117/mth.
	X			Model 630/1630 – full duplex (no voice-switching)	Buy – $1893/$2420 Rent – $154/$197/mth.
	X	X		Model 634/1634 – voice-switched – convertible – 2 or 4 wire	Buy – $2164/$2691 Rent – $176/$219/mth.
		X		Model 611/1611	Buy – $964/$1475 Rent – $78/$120/mth.
Dialogue 5000 Tech 5		X	medium	– speaker/microphone units – push-to-talk (locking) microphone – volume levels balanced and set – full duplex, quality sound	$3690 per station

Bridges

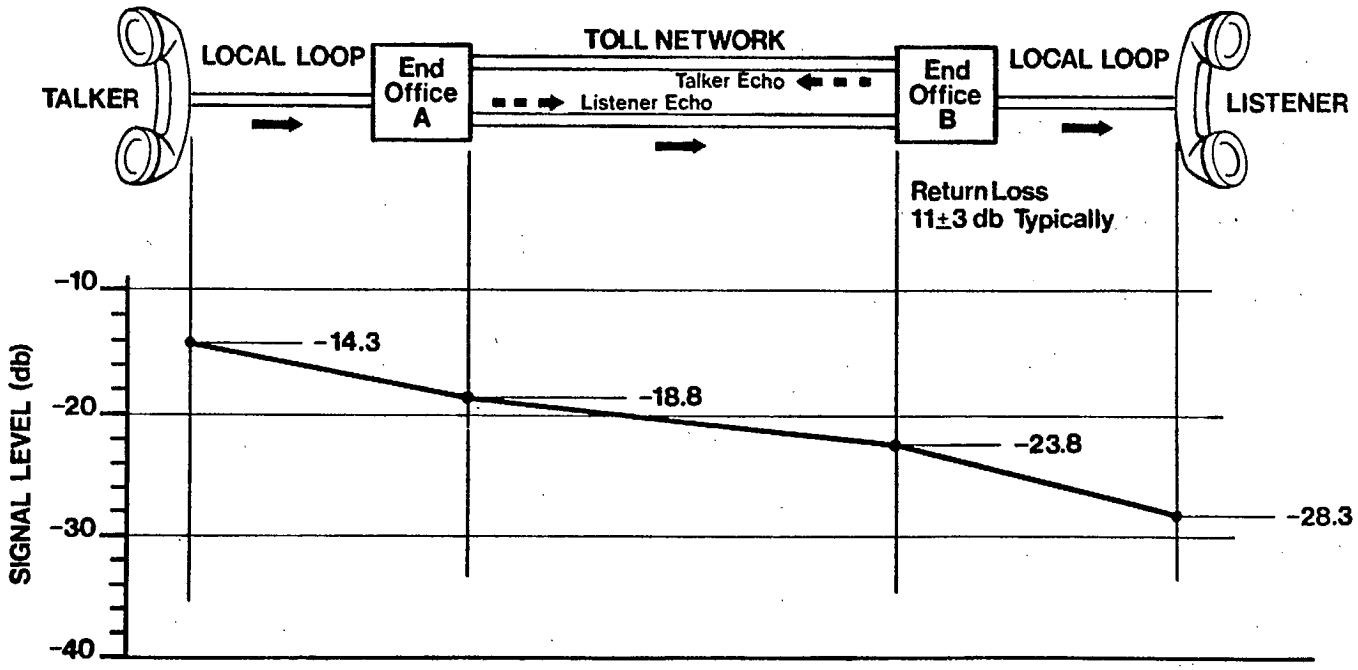
A conference bridge is required to connect three or more locations simultaneously for multi-point discussion.

Considerations

Capacity

How large will conferences be and how many will be arranged at the same time? How great are the distances between locations? These are only two of the questions you must ask to determine the number of ports required and the capacity of the bridge you need.

Figure 4/ Signal Loss on Regular Telephone Connection



There are bridging devices which permit three-point calls only, and there are devices that allow 50 locations to be linked simultaneously. Some bridges function best over short distances and are suited only for regional conferences, while others can bridge together points around the world.

Audio Quality

Audio quality is affected by transmission loss, echoes and noise.

- Transmission Loss

  On the regular telephone network, voice levels on calls depend to a large extent on routing. The further a signal travels, the more the voice level declines (Figure 4). With bridging, the problems of transmission loss are increased because of the number of lines connected and the contrast between levels of lines connected and levels of voices from different locations. The positioning of the bridge affects transmission loss, but amplification in the bridge can compensate for it.

Positioning – the location of the bridge, or its positioning in the telephone network affects transmission loss (Figure 5A/B). *Mid-point* bridges are located at the centre of the network in the telephone company central office. This minimizes contrast between different locations and helps control external noise and echoes. This option is available only with the cooperation of telephone company. Operator-handled conference calls employ mid-point bridges. *End-point* bridges are located at the end of the network on customer premises and result in considerable transmission loss unless corrective measures are taken.

Expansion

Bridges that allow for expansion can be purchased. Consider buying such a bridge if you anticipate growing needs.

Options

Public Bridges

- Bell Conference Operator
  The Bell conference operator will connect up to 58 locations anywhere on the telephone network, simultaneously. Costs are operator-assisted rates plus a conference charge. In addition, Bell now offers Conference 200, a meet-me service in which participants enter a conference by dialing an assigned number. The originator pays a conference charge and participants are charged if they use DDD lines. Audio quality for either service depends on the quality of the lines and call routing.
- Broadband Conference Operator
  For CNCP Broadband subscribers, there is a CNCP conference operator who can connect up to 20 Broadband locations. Alternatively, for a monthly charge, subscribers can rent use of the CNCP bridge and dial up their own conference between pre-set combinations of fixed locations.
- Third-Party Commercial Services
  Several American companies now operate Meet-Me conference services. Participants dial a pre-set number and are linked by an operator who manually adjusts the voice levels.

Figure 6A/ Meet-Me

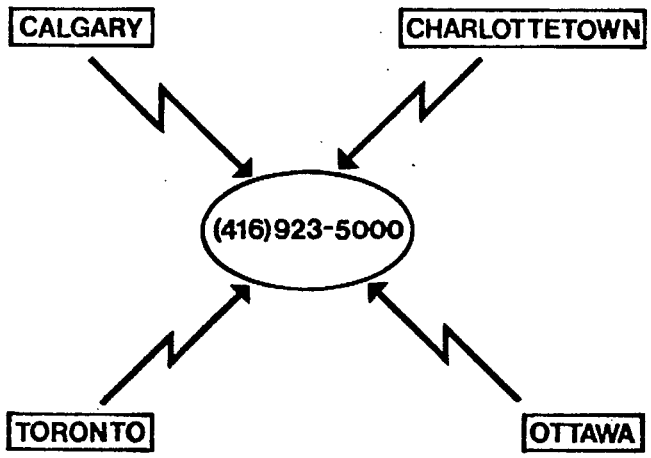


Figure 6B/ Dial-Out

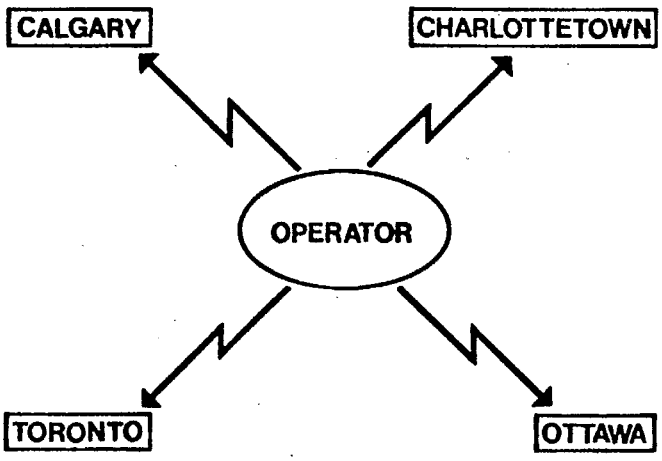


Table 3/ Comparison of Toll Charges: Public Bridges

	TCTS Conference 100 (Operator) 1 hour	CNCP Broadband (Direct Dial) 1 hour	TCTS Conference 200 (Meet-Me Service) 1 hour	Darome Connection Danbury, Connecticut (Meet-Me) 1 hour
National Ottawa Vancouver Edmonton Quebec City Winnipeg Halifax	$342.27	$246.00	$386.06	$357.00
Regional Toronto Ottawa Kingston	$ 95.40	$ 21.60	$124.41	$139.73
International Montreal Vancouver New York London	$257.29	—	$249.95	$356.30

These rates are based on station-to-station calls made during regular billing hours. They will be considerably reduced if toll-free lines are used or if calls are made during discount hours.

Table 5/ U.S. Suppliers of Bridges

Name and Supplier or Manufacturers	2-Wire	4-Wire	Capacity lines	Characteristics	Approximate Price (USA)
500 WA, 900 WA, 100 WA **Amplified Conference Communicators** National Telephone and Electronics	X		6	– desk-top – audio adjustment for particular location – manual	
Telepatcher KTS 350 **KTS 500** **KTS 1700** Telephone Equipment Corporation AEL Microtel (dist.)	X		5-24	– desk-top – dial out or meet-me – manual – sound quality variable – KTS 1700 can accommodate 3 conferences simultaneously	$500-2000
Axis or CEAC Conference System CEAC	X	X	8 or 16	– manual or fully automatic – dial out or meet-me – automatic signal lever level adjustment – talker identification – direct-dialed – some ports may be in listen-only	$12 000
Universal Conferencing System American Telephone and Telegraph	X		8-6	– PBX installed – meet-me or dial out	lease approx. $800/mth.
Uni-Linx Small World Exchange	X		20-50	– microprocessor controlled – 2 or 3 lines open simultaneously to minimize voice-switching – no signal conditioning	$40 000
Contech – 1200 Westell Inc.	X X	X	12 24	– microprocessor based – dial out or – meet-me – voice synthesizer "talks" to customer	$25 500 36 000
Telco System		X X X X	3 4 6 8	– PBX installed	
	X X X		3 or 4 4 6	– active	

Table 6/ Types of Electronic Graphics

Gemini 100 Electronic Blackboard	Audio-Graphic Teleconferencing (AGT) Terminal	Telewriter II	Audio plus Telidon (Conference 500)
– input terminal resembles a blackboard (approximately 4' x 5½')	– 4-wire fully integrated system	– real-time interactive graphics communication system	– distributes electronic slides (i.e., Telidon pages) to remote locations
– output terminal is a standard television monitor	– audio: 6 position teleconferencing table equipped with built-in microphone, LED display and loudspeaker	– uses dial-up phone lines	– provides for creation, manipulation, storage and retrieval of slides
– graphics and voice are transmitted via two regular telephone lines	– graphics: an electronic writing pad and pen, graphic processor and television monitor	– includes: electronic pen and tablet, colour monitor, graphic processor and a modal phone	– each location is equipped with Telidon terminal (decoder, RGB monitor and keypad) and a second telephone line
Contact: AT&T	Contact: FTC Services	Contact: FTC Services	Contact: Bell Canada

Figure 7/ Electronic Blackboard

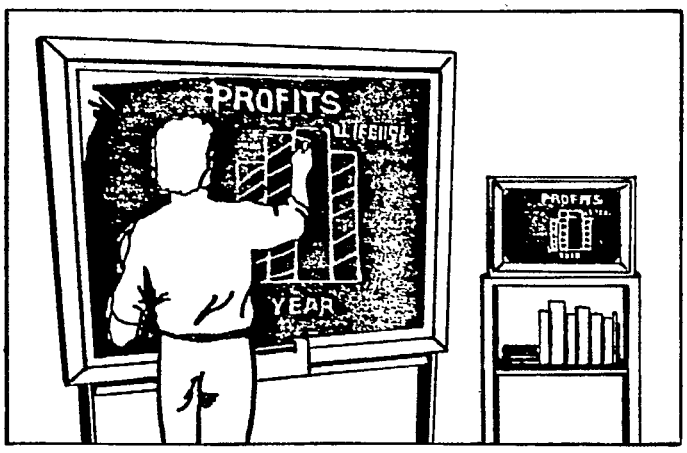
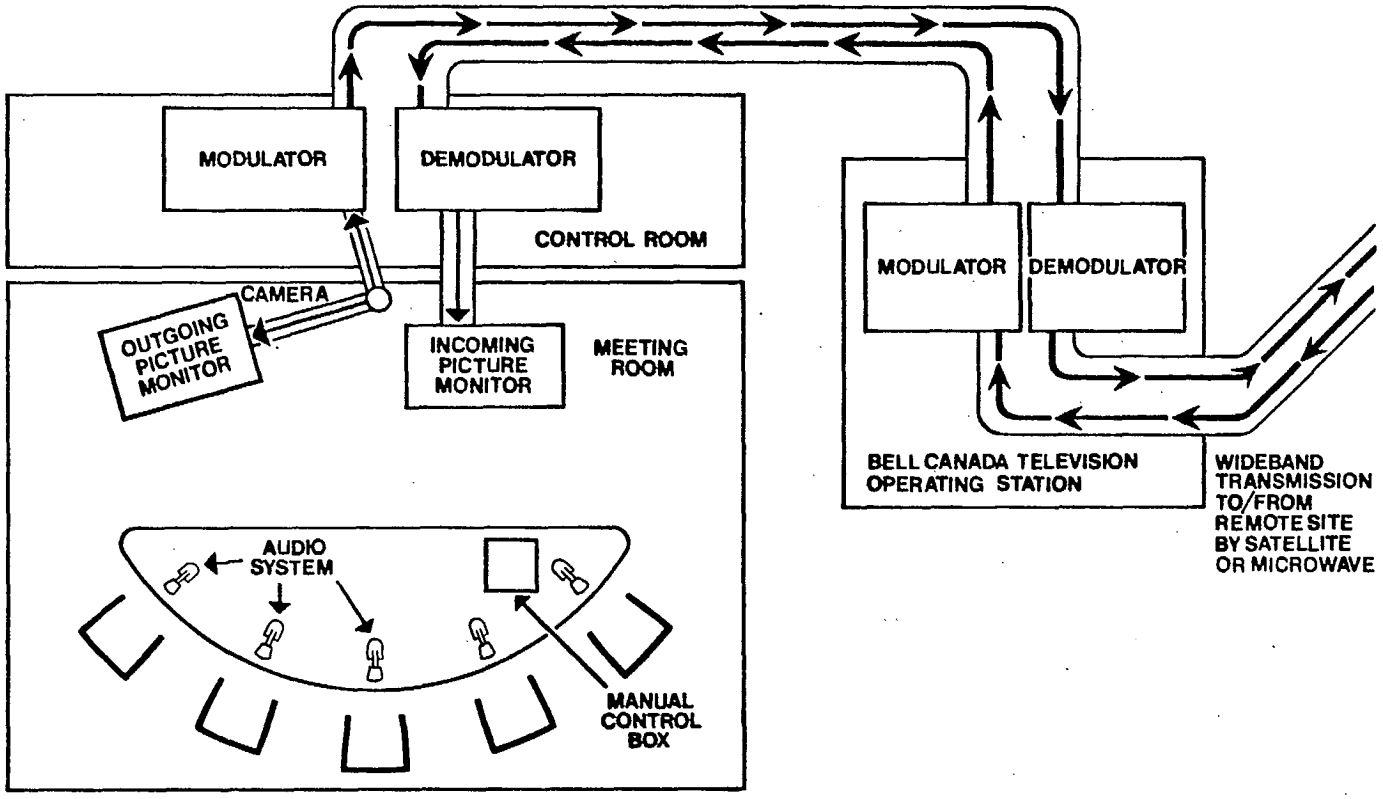


Table 7/ Freeze-Frame Suppliers

Name and Company	Resolution	Transmission Time per Frame(s)	Grey Scale	Characteristics
Audisee Video System Kelcee and Associates	256 x 256 256 x 512 512 x 512	34 75 148	64/256	– black and white or colour – transmits frame of information – hard copy – option – multiple memory – 2 speeds – auto receive
Phoneline Television Robot Research Faxtel Information Systems	256 x 256 128 x 256 128 x 128	35 17 8.5	64	– black and white – digital or dual memory – transmits frame of info – transmitter/transceiver
Telephone Video System Nippon Electric Co.	262 x 200 262 x 400 262 x 350	20 40 55-220	64	– black and white – colour – pointer and scrambler options – transmits field of information – highspeed options

Supplier or Manufacturer	Product
Miller Communications Systems 300 Legget Drive Kanata North Business Park Kanata, Ontario K2K 1K5	Consultant
Nippon Electric Company Toronto Office P.O. Box 123 Commerce Court Postal Station Toronto, Ontario M5L 1E2 Mr. Shiratori Chief Representative (416) 363-2431	Telephone Video System (Freeze-frame)
Northern Telecom Canada Ltd. Subscriber Equipment Sales Group 304 The East Mall Islington, Ontario M9B 3E4 Brian Korson Director, Sales Planning	Companion I (Terminal) Companion II (Terminal) Logic Handsfree (Terminal) Conference 2000[R] (Terminal) SL1 (PBX with conference feature) Vantage 12 (electronic key system) Vantage 48 (with conference feature)
Pylon Electric Development Co. 2300 Victoria St. Lachine, P.Q., (514) 637-1186	TCS-10 (Bridge)
Rauland-Borg 1361 Huntingwood Drive Scarborough, Ontario M1S 3J1 (416) 248-6550	Phillips Conference System (Terminals)
Rockwell / Wescom International 45 Sinclair Avenue Georgetown, Ontario L7G 4X4 D. Beckingham (416) 877-0191	Bridges
Tech 5 105 Schneider Avenue Kanata, Ontario K2K 1Y2 (613) 592-3335	Dialogue 5000 (Terminals)
Ted Regan Productions 42 Nottingham Drive Islington, Ontario M9A 2W5 (416) 239-0369	Consultant: multi-point and studio video conferencing

Figure 10/ Full Motion Video System



Quality

There is a wide range of equipment available with different degrees of quality. Video conferencing need not be up to broadcast standards, but it must be sufficient to fulfill the users' meeting requirements and fit with the corporate environment.

Control

Depending on preference and budget, the video conference equipment, particularly cameras, can be operated by a technician, by the chairman of the meeting or be fully automated. With a technician-operated system, security may be a concern. With a user-operated system, training and human factors engineering are required. With systems employing automatic features, such as voice-activated cameras in which cameras focus on the person speaking, participants must adjust to the equipment's capabilities.

Cost

A video conferencing studio has been set up for as little as $25 000 per location or as much as $600 000.

Number of Locations

At present, video conference transmission is possible in Canada between specific locations. Private studios can be linked with public facilities. You may, because of anticipated volume, wish to install private facilities in some locations and make use of telephone company or other facilities elsewhere.

Table 8/ Suppliers of Video Conferencing Services *

Name and Suppliers	Service
Bell Canada	– provides video conferencing between Bell studios in Toronto, Ottawa, Montreal, Quebec etc. and on some occasions, between customer premises. Expansion of facilities is planned in 1983 to London, Calgary and Edmonton.
Canadian Teleconference Network	– provides turnkey service including planning, arranging, production etc. for point-to-multi-point video conferences.
Kelcee Communications	– consultation, preparation, equipment supply and installation.
Adcom Electronics Limited	– complete turnkey operation, needs analysis, room design, equipment supply and installation. Full warranty on all goods and services. Five year service contract across Canada.
Teleglobe Canada	– provides international teleconferencing to U.K. (London) and France (Paris) with planned expansion.

*Components may be purchased directly from a wide variety of suppliers of cameras and monitors.

Room Design

The design of your teleconferencing meeting rooms is an important aspect of system design. In many cases, no modifications are made to existing meeting rooms; in other cases, an entire studio is designed with teleconferencing in mind.

Considerations

Teleconferencing Only or Mixed Purpose

Rooms may be dedicated to teleconferencing or used for regular and "electronic" meetings.

Acoustics

Both noise from outside and noise within the room will affect the quality of audio conferences. External noise can be reduced by locating the room in quiet spot or by acoustic conditioning. Noise within the room from air conditioners, lights, etc. should be controlled as well and reverberation minimized to reduce echo and feedback.

Hard surfaces with the exception of the table top, should be covered with carpets, drapes and acoustic tiles to reduce sound reflection.

Lighting

With video conferencing, remember that lighting affects participants as well as image quality. Ideally one strives for a natural appearance to be transmitted. Often regular meeting room lights will produce unacceptable shadows such as sunken eyes. While bright lights may improve picture quality, they may also make the participants uncomfortable. The technical and human lighting requirements should be carefully examined, and in some cases, with slight modifications, regular lighting may be sufficient.

Layout

Ideally the layout of the room should be comfortable, with the equipment as inobtrusive as possible. Currently, there is a considerable amount of debate over the best shape of table for video conferencing to ensure participants are equidistant from the monitors and cameras. Relationships between people and hardware in a typical situation is important.

Decor

With video conferencing, the colours of furnishings in the room may be of concern as certain shades will complement participants more than others.

Location

Ideally the room should be centrally located and easily accessible as people will not, generally, travel far to teleconferences. The room should also be politically neutral if it is for common use. A room which is, for example, near executive suites will probably be used less by middle management than a room in a less forbidding location.

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Appendix/ Suppliers and Manufacturers of Teleconferencing Equipment and Services

Canadian Suppliers

Supplier or Manufacturer	Product
Adcom Electronics 310 Judson St. Toronto, Ontario M8Z 5T6 Gary McKoen (416) 251-3355	Consultant: turnkey operation, needs analysis, room design, equipment supply and installation.
ACS Management Consulting Services 60 Queen Street Suite 403 Ottawa, Ontario K1P 5Y7 (613) 236-6608	Consultant: communications needs analysis, network and equipment selection, teleconferencing introduction and training
AEL Microtel 1211 Denison Street Markham, Ontario L3R 4B3 Dave Taylor (416) 475-8660	Speakerphone 881 and 882 PC50B (Speakerphone) Telephonic Equipment Corp. Meet-Me Bridge GTD 120 PABX (with bridging capability)
Bayly Engineering 167 Hunt Street Ajax, Ontario L1S 1P5 Terry Brent (416) 683-8200	Bridge
Bell Canada 393 University Avenue Toronto, Ontario M5G 1W9 Julie Fortier Product Mgr., Teleconferencing (416) 599-6069	Logic Speakerphones Conference 2000® – rental Conference Operator or 100 Conference 200 (meet-me) Conference 300 (N.B. Tel Bridge)
Louise Roberge, Product Mgr., Conference 500 (416) 599-1645	Conference 500 (Audio plus Telidon)
John Murphy Sales Representative Broadband Video Services (416) 599-6372	Video Conferencing
Bell Northern Research P.O. Box 3511, Station "C" Ottawa, Ontario K1Y 4H7 Paul Strudwick, Mgr. Future Communications (613) 727-4325	Consultant: custom design and implementation

Supplier or Manufacturer	Product
Miller Communications Systems 300 Legget Drive Kanata North Business Park Kanata, Ontario K2K 1K5	Consultant
Nippon Electric Company Toronto Office P.O. Box 123 Commerce Court Postal Station Toronto, Ontario M5L 1E2 Mr. Shiratori Chief Representative (416) 363-2431	Telephone Video System (Freeze-frame)
Northern Telecom Canada Ltd. Subscriber Equipment Sales Group 304 The East Mall Islington, Ontario M9B 3E4 Brian Korson Director, Sales Planning	Companion I (Terminal) Companion II (Terminal) Logic Handsfree (Terminal) Conference 2000® (Terminal) SL1 (PBX with conference feature) Vantage 12 (electronic key system) Vantage 48 (with conference feature)
Pylon Electric Development Co. 2300 Victoria St. Lachine, P.Q., (514) 637-1186	TCS-10 (Bridge)
Rauland-Borg 1361 Huntingwood Drive Scarborough, Ontario M1S 3J1 (416) 248-6550	Phillips Conference System (Terminals)
Rockwell / Wescom International 45 Sinclair Avenue Georgetown, Ontario L7G 4X4 D. Beckingham (416) 877-0191	Bridges
Tech 5 105 Schneider Avenue Kanata, Ontario K2K 1Y2 (613) 592-3335	Dialogue 5000 (Terminals)
Ted Regan Productions 42 Nottingham Drive Islington, Ontario M9A 2W5 (416) 239-0369	Consultant: multi-point and studio video conferencing