Nova Scotia: A National Laboratory for the Development and Evaluation of Canadian Health Information Systems

May 2, 1997

EXECUTIVE SUMMARY

Nova Scotia requires and will eventually implement information tools for clinical care, administration, research, teaching and consumer education. These new technologies will facilitate communications between providers and communities and will act as decision support for clinical care, administration, research, teaching and consumer education. The technology introduced in Nova Scotia should support Nova Scotian and Canadian models of health care delivery. The Federal Government has recognized the importance of supporting the development of health information systems in Canada and has made a financial commitment, through HEALNet and in the 1997 Federal Budget, to support the advancement of evidence-based health care thorough improved health information and research.

The purpose of this proposal is to recommend the province of Nova Scotia as a developmental site for a comprehensive health information system which will be applicable to all provinces and other jurisdictions in North America and Europe while providing commercial opportunities for private sector partners in both domestic and export markets. Nova Scotia’s size, population and existing collaborations between sectors in the health industry make Nova Scotia an ideal environment for a national health systems laboratory.

Comprehensive health information systems must serve the needs of various users and provide proper support for clinical care, health system administration, public and provider education, and research. The most effective systems will be developed by those who are able to understand the needs of the various users. Efficient systems will be able to provide real time decision support and be efficient with regard to data entry, collection and aggregation.

We are proposing a comprehensive pilot project in Nova Scotia before the broad introduction of information technology. New systems will provide significant benefits to all stakeholders, but the cost and benefits of these systems will be a direct reflection of our success in choosing the right tools and content to support users. New information systems must satisfy various components of the health care industry and substantial collaboration, analysis and discussion is essential before widespread implementation, in order to reduce controversy and cost following implementation. A comprehensive pilot project will address these needs.
The most useful information systems collect information from clinical encounters, including telemedicine applications. The information should than be available, real time, to support clinical care, teaching, research administration and education. Additionally, the information, once collected should be retrievable for subsequent clinical encounters, public information and also for aggregation for use in assessments of population health and health system administration. Appropriate privacy protections are also necessary. Marker projects will be developed with the idea that a successful comprehensive health information system will meet the needs of a variety of marker projects. Additionally, we will include experts with the ability to extract meaningful information from the developing data repositories. For example, artificial intelligence and neural network methodologies can facilitate the discovery of relationships between health care activities and results.

We are proposing the formation of a broad based Nova Scotia health information system steering committee with Provincial and National Expertise. The purpose of this steering committee will be to steer the overall project and insure that the components of our health information systems fit with each other. The steering committee will work closely with existing structures in Nova Scotia including the Provincial IT working group and the Dalhousie Medical School Medical Informatics Steering Committee.

Marker project committees will recommend the techniques necessary to meet the needs of each project. The Nova Scotia ICONS and IDEA studies would be examples of marker projects and an overall health information system must meet the needs of these projects. Other proposed committees include a scientific advisory committee, a technology advisory committee and a commercialization and marketing committee.

Analysis and implementation activities will occur concurrently. In the first stage lasting 12-18 months and costing $2,213,500 the project will undertake a detailed review and analysis of existing infrastructure and simultaneously implement a planned telemedicine project as part of an overall information systems strategy.

Simultaneously, work with provider groups will be undertaken in order to develop marker projects which meet user needs. Work with technical experts will identify the most effective ways to collect information, provide real time prompts to support clinical care and how to use information to improve health system administration.

Telemedicine trials have identified a need for telemedicine capacity in some parts of Nova Scotia and an analysis conducted by Dalhousie Continuing Medical Education suggests that communities in Nova Scotia will benefit from Telemedicine applications. Consequently, we will begin implementation of telemedicine applications during the first phase of this project.
The second stage, costing $15,000,000 and taking two years will result in the implementation of tools and technology to support clinical care, teaching, administration, public and provider education, and research in one area of Nova Scotia. Pilot projects, reviewing the use of technology to support alternate forms of service delivery will also be included as part of the marker projects.

**Nova Scotia: A National Laboratory for the Development and Evaluation of Canadian Health Information Systems**

**INTRODUCTION:**

Nova Scotia requires and will eventually implement information tools for clinical care, administration, research, teaching and consumer education. These new technologies will facilitate communications between providers and communities and will act as decision support for clinical care, administration, research, teaching and consumer education. The technology introduced in Nova Scotia should support Nova Scotian and Canadian models of health care delivery. The Federal Government has recognized the importance of supporting the development of health information systems in Canada and has made a financial commitment, through HEALNet and in the 1997 Federal Budget, to support the advancement of evidence-based health care thorough improved health information and research.

The need for improved information systems to support health services in Canada has been highlighted in a number of reports over the past decade. Most recently, the National Forum on Health highlighted the need for improved health information as one of the key priorities in the reform of the health system. This position was supported in the 1997 Federal Budget- "The evidence on which health care providers base their decisions is crucial to improving the management and cost efficiency of the health care system. The development of a national health information system accessible to all those in the health system will ensure that accurate, up-to-date information is on hand when it is needed. The recent National Forum on Health report advocated a federally-led strategy to integrate existing health information into a national health information network."^1

The purpose of this proposal is to recommend the province of Nova Scotia as a developmental site for a comprehensive health information system which will be applicable to all provinces and other jurisdictions in North America and Europe while providing commercial opportunities for private sector partners in both domestic and export markets.
Comprehensive health information systems must serve the needs of various users and provide proper support for clinical care, health system administration, public and provider education, and research. The most effective systems will be developed by those who are able to understand the needs of the various users. Efficient systems will be able to provide real time decision support and be efficient with regard to data entry, collection and aggregation.

COMPREHENSIVE AND ANALYTICAL PILOT PROJECT

We are proposing a comprehensive pilot project in Nova Scotia before the broad introduction of information technology. New systems will provide significant benefits to all stakeholders but the cost and benefits of these systems will be a direct reflection of our success in choosing the right tools and content to support users. New information systems must satisfy various components of the health care industry and substantial collaboration, analysis and discussion is essential before implementation in order to reduce controversy and cost following implementation. A comprehensive pilot project will address these needs.

A comprehensive information system should support the collection, warehousing, aggregation and dissemination of information of a large variety of health care applications.

What barriers exist to using new technologies now.

The main barrier is that Nova Scotia and Canada has not had sufficient collaboration to identify and assess the operational requirements and uses of new information technology.

Substantial effort is required by each regional health board as well as by the Departments of Health and providers to identify the hardware and software tools which are most likely to help organization and individuals to fulfill their missions.

Valuable tools exist to support the use of evidence for clinical care, teaching, administration and research. But, the variety of developers have not had the opportunity to produce an integrated product. For individual clinicians major efforts are required for selection and evaluation of the claims made by hardware and software vendors.

Tools which purport to support the use of evidence for clinical care, teaching, research and evaluation have, by and large, not been properly tested nor widely used as part of an overall information system.
Our efforts, using local and national health scientists, will help to produce recognized advice about the tools which are most useful to support clinical care, teaching, administration and research.

The academic and private sector are prepared to collaborate with us in initiatives to improve computer literacy among physicians and others in the health care industry.

**USE OF HEALTH INFORMATION SYSTEMS:**

The most useful systems collect information from clinical encounters, including telemedicine applications and population health survey. The information should than be available, real time, to support clinical care, teaching, research, administration and education. Additionally, the information, once collected should be retrievable for subsequent clinical encounters, public information and also for aggregation for use in assessments of population health and health system administration. Appropriate privacy protections are also necessary. Marker projects will be developed with the idea that a successful comprehensive health information system will meet the needs of a variety of marker projects and also allow health workers to learn about the relationships between activities and results.

**CLINICAL PRACTICE**

It has been estimated that the doubling time of medical knowledge is about 19 years. Consequently, practitioners require decision support tools in order to provide high quality care. For patients, the consequence of missing information can be delayed and missed diagnosis or inappropriate care. One study, for example, found a mean delay of 11 years (range 0-40 years) between the first major signs of homocystinurea and the ultimate diagnosis. Similar delays have been reported for other conditions such as Addison’s disease.

Recognizing a condition is no guarantee that proper treatment will be delivered. Strong evidence exists supporting the use of beta blockers and thrombolytic agents in the management of acute myocardial infarction. Nevertheless, studies suggest that major opportunities exist to improve the therapy of acute myocardial infarction. About 20% of AMI patients who would benefit from thrombolytic therapy do not receive it, while some patients receive drugs which are not beneficial. In Nova Scotia a major project led by Dalhousie University and the QEII Health Sciences Centre is aimed at examining and improving the treatment of cardiovascular disease in Nova Scotia through the use of a new information system.

Education alone is insufficient to maintain changes in practice behavior since behavior following education can drift back to previous practices. Concurrent
decision support is one intervention which could prompt appropriate care and thereby produce improved results. A pilot study using concurrent review methods at the Halifax Infirmary site of the QEII Health Sciences Centre showed that length of stay and unnecessary resource use declined when physicians were given real time prompts about a patient’s health status and need for unique hospital services.

Overall, studies using randomized controlled trials produce consistent evidence which supports the effectiveness of computer-based clinical decision support systems (CDSS). The most promising areas of impact appear to be:

1. computerized reminders to perform preventative care
2. improving follow-up care
3. improving prescription management with corresponding reductions in drug costs

The studies strongly support the importance of having the information available to the physician at the time of the patient encounter.

Consumers

The growing trend towards greater consultation and participation in decision-making by consumers produces new challenges to provide valid and relevant information to patients which reflect their circumstances and location. Current information resources are inadequate for this purpose and new systems are required which produce localized evidence-based information for consumers. Examples of Nova Scotia efforts to support consumer education and improved delivery systems include pilot projects in personalized health information for teenagers and a web site developed by Nova Scotia rural physicians which provides useful information for the public and providers. Unfortunately, we have not yet publicized a wide variety of readily available and peer reviewed information for the public. Moreover, many people do not have ready access to the hardware, software and skills required to do independent searches. Our project will work to make these resources more widely available as a means to improve public self-reliance.

Administration, Planning, Education, and Research

Administrators and health system researchers also require appropriate tools to evaluate the cost, types and quality of care provided. In Canada, including Nova Scotia, researchers utilize hospital and ambulatory care information systems which collect large amounts of data but which are limited in their ability to support timely decisions for clinical care or administration. For example, each chart of a discharged patient is subject to detailed abstraction and review by trained health records coders,
but health institutions, regional health boards and governments in Canada remain limited in their ability to regularly and systematically demonstrate the benefits and adverse effects of most health care activities. Moreover, reviews comparing length of stay between various institutions are not useful because current systems do not collect meaningful information about illness severity\textsuperscript{16} or the change in health status resulting from treatment.

Information tools will help promote health by providing timely information to consumers and reminders about health maintenance activities such as immunization and exercise. Information technology can also improve the efficiency of health care by reducing unnecessarily repetitive laboratory investigations\textsuperscript{17}.

Comprehensive information is required to ensure adequate accountability in public spending. The dominance of fee-for-service models of physician remuneration has led to the development of large administrative databases which are limited in their ability to provide valid and useful information to other stakeholders such as planners/researchers. The growing interest in alternative payment mechanisms, such as capitation, will eliminate these administrative databases. This poses a serious threat to health care administration and research in Canada. Health system administration, research and clinical care require proper information, consequently, it is essential that new encounter-based information systems are developed and evaluated while communities develop new models of health care delivery and new ways to pay for health care.

The growing importance of health services and population health research has resulted in an increased need for comprehensive health information systems. Groups doing clinical and administrative research in Canada have been reliant on disease specific studies and on administrative data bases such as those developed in hospitals to review volumes of service and those developed by government to pay providers for clinical services. Unfortunately, these data bases have been inadequate as measures of effectiveness or efficiency since they provide no information at all about changes in health following health service activities and, consequently, severely limit the ability to conduct outcomes research. The growing importance of cost-effectiveness analyses in all aspects of health research requires an enhanced ability to conduct research in "real-world" settings and this, in turn, requires reliable and valid health information which tracks patients over time. The devolution of planning authority to community-based boards which is underway in many jurisdictions is creating new challenges with respect to the provision of reports and information which is meaningful to lay persons.

**PROVIDER EDUCATION**
A comprehensive health information system will provide objective data for use in determining learning needs of Nova Scotia physicians based upon population health information. Using this data, educational programs can be designed to address targeted physician (and other health care provider) learning needs and, hence, to change the practice patterns of physicians (and other providers). The outcome of the educational interventions, i.e., its impact in changing the targeted physician behaviour and on patient health, can be measured using data collected following the program, and comparing it with whatever information was collected prior to this program.

Dalhousie University Continuing Medical Education believes that the development of health organizations which are internally networked will be beneficial. The ability to review records including inpatient stays, clinic visits, emergency visits and x-ray and laboratory information would help support an analysis of diagnoses, management, follow up and outcomes and thereby assist providers and educators in their efforts to develop appropriate educational programs.

The efficiency of CME could be improved if instructors and learners did not have to always rely on face-to-face contact. Dalhousie CME has developed some capacity to provide videoconferencing programs and information over the internet. Improved provider access to modern tools and technology will improve provider education. Access to real time prompts at the point of care would provide immediate information about diagnosis and management and would provide real time CME targeted to specific areas of need.

COMMERCIAL OPPORTUNITIES FOR NOVA SCOTIA AND CANADA:

Canadians are investing heavily in information systems. However, these investments are largely in US based technology systems. There are over two-hundred instances of Canadian based health care providers investing between $250,000 and $5,000,000 in various systems. Unfortunately, we have not made an effort to insure that these systems can communicate with each other in meaningful ways, nor has there been sufficient effort to investigate whether these systems actually meet the needs of diverse sectors in the health care industry. Moreover, there have been no organized initiatives to encourage these systems to accept and support software developed in Nova Scotia and elsewhere in Canada to serve the needs of the Canadian health care system.

In Nova Scotia and elsewhere in Canada, an active group of small private sector companies are developing technical tools specifically for Canadian health care applications. Without an organized effort to ensure that imported technologies are compatible with Canadian products, our software industry will languish. We will
import not only the tools to manage our health care system but also the US-based models which the technology supports.

Canadian companies need to develop an improved capacity to compete in international markets and to capture a larger share in the Canadian health care sector. This project promotes the development of project specific strategic alliances and partnerships to create the necessary synergies and infrastructure to be competitive in the Canadian marketplace and to develop increased capacity to enter international marketplaces. Effective evaluation of Canadian health information tools will increase their marketability and encourage software vendors to accept proven Canadian tools as a benefit of entry into the Canadian marketplace as well as increase the overall ability of Canadian suppliers to generate international sales.

Within Nova Scotia firms like Concentrics Communications have been developing systems to improve communications between various participants in our health care system. Telemedicine applications are being developed and evaluated by companies like Tecknowledge Healthcare Systems Inc. and Digital Image FX Inc. Shared Care Informatics is developing concurrent review software which provides real time prompts about the setting appropriateness of hospital care. The opportunity to test these products as part of larger health information systems and the use of systematic evaluation methods will improve the international marketability of these products.

**WHY NOVA SCOTIA AS A NATIONAL LABORATORY**

The Province of Nova Scotia contains a diverse population of 937,000 persons in rural and urban settings. The population base is sufficiently large to ensure that Nova Scotia-based systems will have relevance to the rest of the country but, at the same time, is sufficiently limited to ensure a manageable pilot project. Given the environmental and economic circumstances of the province, it also provides an opportunity to ensure that key health determinants can be addressed.

The Department of Health has already invested substantial time and resources in reviewing information needs and technologies and this knowledge and developmental work will be applied to the proposed project. The provincial government is fully committed to the development, implementation and evaluation of a superior health information system, based on national inputs, for the province and the purpose of the current proposal is to seek a Federal contribution which will allow for the development of a more comprehensive information system which will serve as a model for other jurisdictions and which will address the needs identified by the National Forum on Health. The Province has already given expression to their support for improved health information by providing financial support for the development.
of a province-wide information system in Emergency Health which will be a key component in a comprehensive health information system.

ALTERNATE DELIVERY SYSTEMS

The Nova Scotia Department of Health and provider groups are discussing alternate forms of health care delivery and primary care remuneration and consequently, the province provides an excellent opportunity to develop a health information system which can support current or new models of health care delivery and payment. The Province has also undertaken a process of devolution of planning authority to regional citizen-based boards. This process is underway or complete in a number of provinces and the information requirements of these groups provide a new challenge. The proposed pilot system in Nova Scotia will be designed to meet the needs of these lay groups and will, consequently, ensure the relevance of the system to other devolved jurisdictions.

The successful development of the pilot project in Nova Scotia will be facilitated by the presence of a number a critical resources. The National Centre of Excellence in Women's Health is working to develop a database relevant to women's health issues and the results of their work will be incorporated into the proposed provincial system. The Population Health Research Unit and the Medical Informatics program at Dalhousie University provide the province with considerable experience in the use of large databases in support of research activities. The Department of Health has developed considerable experience and expertise in health information systems strategies through their ongoing leadership in developing a provincial strategy.

The stakeholders in the health system have a tradition of collaboration in Nova Scotia which will be a critical importance to the successful development of comprehensive health information system. All of these stakeholders have come together for the purpose of developing such a system in Nova Scotia. In addition to local collaborators, the Nova Scotia initiative is supported by HEALNet, the National Centre of Excellence for evidence-based clinical decision-making.

THE FEDERAL GOVERNMENT ROLE

The 1997 Federal Budget stated "The evidence on which health care providers base their decisions is crucial to improving the management and cost efficiency of the health care system. The development of a national health information system accessible to all those in the health system will ensure that accurate, up-to-date information is on hand when it is needed. The recent National Forum on Health report advocated a federally-led strategy to integrate existing health information into a national health information network."
Nova Scotia needs a modern and effective Provincial Health Information System. Canada needs a proper laboratory to test information tools and technology and Nova Scotia is the ideal Province to act as a testing site for new tools and technology. Strong participation by the Federal Government, through Health Canada, Industry Canada and the National Centres of Excellence, will ensure that adequate resources are available to expand current activities to meet the requirements of the national health information program and will facilitate the commercialization of the final products.

THE COLLABORATORS

Nova Scotia collaborators include the following constituencies who have already been active participants in the development of this proposal:

1. The Nova Scotia Department of Health
2. The Nova Scotia Medical Society including those with expertise in the implementation and use of computerized decision support and the development of alternate models of health care delivery and funding.
3. Health scientists from Dalhousie including those with expertise in Population Health, Medical Informatics, Library Science, Medical Education, Management, Artificial Intelligence and Data Mining.
4. Academic and provider expertise in epidemiology and disease surveillance including diabetes and cancer.
5. The Nursing community and the nursing academic sector.
6. Health educators in Continuing Medical Education with expertise in conducting needs assessments and in designing, implementing and evaluating educational programs.

The developing Nova Scotia private sector includes expertise in communications, health services evaluation, telemedicine, and remote sensing.

HEALNet (Health Evidence Application and Linkage Network) is a federally funded National Centre Excellence which will serve as a vital resource and think-tank to this initiative. HEALNet network consists of 22 research institutions involving researchers across the country. The purpose of HEALNet is to support the use of evidence for health care and health care administration in Canada and to develop Canadian tools and technologies which can be used internally and also sold to foreign markets. HEALNet scientists represent a national resource in the use of computer information technology for decision support and public health. HEALNet supports a Nova Scotia initiative to systematically introduce tools to support evidence based decision making and is prepared to participate with Nova Scotia in the development of a laboratory to properly test new health information technologies. HEALNet is prepared to support
the travel costs of National HEALNet scientists so they can be part of a scientific advisory committee to the project steering committee. Other personnel costs would be the responsibility of the project committee from funds generated for the feasibility study and implementation process.

DALHOUSIE MEDICAL SCHOOL

Population Health Research Unit
Dalhousie Medical Informatics
Continuing Medical Education (CME)

Dalhousie Population Health Research Unit has a research and administrative support function. The value of the Population Health Research Unit depends on the reliability, breadth and validity of the information collected by our health care system. Consequently, the Population Health Research Unit is an appropriate collaborator. This Unit has the expertise to advise on the types of information which can be collected to provide aggregate information for health services research and for population health evaluation.

Dalhousie University Medical Faculty influence the type of health information which is collected and the way it is used. Dalhousie Medical school has a strong interest in the development of information systems which facilitate clinical care, teaching, administration and research. In particular, Dalhousie is anxious to contribute to efforts which will increase the use of evidence for health care and administration and the development of systems to help assess changes in health status resulting from treatment. Dalhousie Family Medicine has done substantial pilot work in encouraging the use of evidence-based care throughout the province. New information systems must support this initiative. Because of its potential to provide novel, integrated CME interventions, and to measure outcomes, this HEALNet opportunity will provide an unprecedented opportunity for research into educational strategies and evaluation of clinical outcomes.

DEPARTMENT OF HEALTH

The Nova Scotia Department of Health is an important partner in this project. The Department clearly recognizes the need for proper information, collected once and aggregated for multiple purposes. The N.S. Department of Health has done a substantial amount of preliminary work related to the technologies required to support a Canadian Health Information system and the nation can benefit from it. Additionally, the N.S. department of health and regions have an ongoing public interest in the development and implementation of valuable tools to support and maintain population health.
MEDICAL SOCIETY OF NOVA SCOTIA:

The MSNS is an important formal advocate for patients and physicians. Moreover, physicians in Nova Scotia play an important role in the collection and use of health information. Consequently, it is important to include the Medical Society as part of the developing process. Moreover, as we develop and pilot test new ways to deliver care and fund care, it is critical that the information systems support rather than hamper the delivery of improved care.

Similarly, provider input is essential to assure an appropriate interface between the technology and human resources.

NURSING

Nurses, including public health nurses, play an important role in the delivery and maintenance of health. Consequently, it is important to have nursing participation and we are glad that a strong member of the Dalhousie nursing school and a member of the Provincial nursing informatics group is collaborating with us.

OTHER COLLABORATORS

Efforts will be made to include other constituencies such as dieticians, public health workers, and physiotherapists as the project develops. A variety of groups have important roles to play as we develop consumer education tools and as we exploit opportunities to systematically assess health where the dimensions of health are comfort, function and illness severity (likelihood of dying.)

DISEASE SURVEILLANCE:

Information systems are meant to provide prompts for care, to survey health status and to produce new information about the effectiveness and efficiency of care. Consequently, it is important that groups such as those responsible for diabetes care participate in the development of these systems. One of our collaborators is a trained epidemiologist who participates in clinical practice and who has a strong interest in improving surveillance and improving care for diabetic patients.

Health information systems must be responsive to the needs of many constituencies. This project will welcome collaboration from other stakeholders in health care and health outcomes who are prepared to participate in the development, integration and evaluation of pertinent integrated information systems.

HEALNET
Nova Scotian population health scientists and health informatics scientists are key stakeholders in the planning and implementation of a health information system for the Province. However, they realize that important expertise exists in other Provinces and that this expertise could help Nova Scotia. In searching for this help, these scientists have become members of HEALNet, and have invited HEALNet to contribute to the N.S. initiative.

We propose that HEALNet plays its role in the following ways:

- HEALNet will agree to identify a team of scientific advisors to work with N.S. scientists in preparing feasible proposals for developing a health information system for the province. HEALNet’s objective is to provide whatever advice it can, and to determine the best way in which HEALNet can otherwise contribute. HEALNet will cover the travel expenses associated with the advisory visits, Nova Scotia will cover other personnel costs.

- We propose that the Cooperative Business Solutions (CBS) proposal identify HEALNet as an important source for information products such as evidence-based decision support tools in office-based (primary and referred care), hospital and, eventually, regional settings. Such tools would be "add on" components to any system N.S. ultimately chooses through an RFP mechanism;

**CURRENT PROJECT ACTIVITIES**

To further the objectives of this project, a Steering Committee was established in early 1997 with representatives of the various stakeholder groups. The members of this committee are drawn from Dalhousie University (Medical Informatics, Population Health Research Unit, Continuing Medical Education, Family Medicine, Pediatrics, Nursing, and School of Health Services Administration), Nova Scotia Government (Department of Health), Government of Canada (Industry Canada, Health and Welfare), Medical Society of Nova Scotia, Canadian Medical Society, HEALNet, and TARA (Telecom Atlantic Research Alliance).

Meetings were held January 10, February 21, March 21, and May 2, 1997. The chair, Dr. David Zitner, made a presentation to Department of Health Information Technology Working Group on February 13, 1997. Members attending national HEALNet meetings included Dr. David Zitner, Dr. George Kephart, and Dr. Mark Kazimirski.

**PROJECT ORGANIZATION- COMMITTEE STRUCTURE:**
We are proposing the formation of a broad based Nova Scotia health information **steering committee** with Provincial and National Expertise including HEALNet (Health Evidence and Linkage Network) collaborators. The purpose of this steering committee will be to steer the overall project and insure that the components of our health information systems fit with each other. Other committees would report to the steering committee and the steering committee will be responsible for overall integration. The committee and steering committee will develop recommendations for the functional requirements of an integrated health information system and will develop the RFPs necessary to develop an integrated information system in Nova Scotia. Subsequently, the committees will work on the evaluation of replies and selection of the tools and technologies required to support the Nova Scotia health care system.

**Marker projects:**

Valuable information systems are designed to meet the needs of various users. The most useful systems collect information from clinical encounters, including telemedicine applications. The information should then be available, real time, to support clinical care, teaching, research administration and education. Additionally, the information, once collected should be retrievable for subsequent clinical encounters, public information and also for aggregation for use in assessments of population health and health system administration. Appropriate privacy protections are also necessary.

Nova Scotia Marker Projects will be designed to provide decision support to the public and providers and will include an education component for both groups. Telemedicine applications will be included as part of an overall strategy to improve communications between those needing information and those able to provide advice.

We expect the private sector including pharmaceutical and technology companies will participate with the Nova Scotia public, provider and academic sectors in the development of the marker projects. Each of the marker projects could be developed in a way which could include appropriate telemedicine applications. Collaborations with the private sector will be welcome and we believe will further contribute to the development and use of evidence based medicine in Nova Scotia.

Nova Scotian investigators under the leadership of Drs. David Johnstone, Jafna Cox and Brenda Ryan have begun an important project to improve the care of Nova Scotians suffering from cardiovascular disease (ICONS-improved cardiac outcomes Nova Scotia). A worthwhile health information system will support the needs of the ICONS project. Similarly, Drs Jean Gray and Ingrid Sketris are implementing IDEA,
a program to improve the use of medications in Nova Scotia and an overall health information system should also meet the needs of this project.

Nova Scotian collaborators have been considering the following additional marker projects which are under development

1. Primary care projects which include a variety of providers and review the provider technology interface (Mark Kazimirski- N.S. Medical Society)
2. Alternate service delivery and alternate funding models (Susan Hutchison N.S. Medical Society)
3. evidence based medicine (Wayne Putnam- Dalhousie Family Medicine),
4. population health (George Kephart- Population Health Research Unit)
5. disease prevention and women’s health (Brenda Ryan, DOH, An NCE for women’s health exists in Nova Scotia and the system we develop should be responsive to the needs identified by this NCE program)
6. decision support for the public (David Zitner- Dalhousie, QE2, )
7. disease surveillance models including diabetes (John LeBlanc- Diabetes.
8. telemedicine applications (David Kaufman, Joan Sargeant-Dalhousie + private sector)
9. Medical education including the identification of areas where educational interventions could be most helpful.(Michael Allen, Joan Sargeant Dalhousie Continuing Medical Education and others at Dalhousie Medical School and elsewhere)
10.Library Applications (Dalhousie Medical School Library)
11.Informatics content, outcome measures (Grace Paterson, Dalhousie Med School
12.Communications/technology education (Ron McLeod, Dalhousie Med School)

Additional possibilities for marker projects include the following and medical expertise and experience with novel forms of service delivery exist in Nova Scotia and elsewhere to support project development in each of these areas.

Additional Potential Marker Projects:

- Asthma
- Chronic Obstructive Lung Disease
- Chronic pain
- Cancer pain and palliative care
- Dermatology including acne
- Hypertension
- Respiratory tract infections
- Renal Disease
• Diabetes
• Arthritis (Function and comfort)
• Orthopedics
• Infant feeding
• Allergies
• Inflammatory Bowel disease
• Hormone Replacement Therapies
• Attention Deficit Disorders - Learning Problems in School
• Immunization
• Acid Pepsin Disease
• Insomnia
• Psychiatric disorders including anxiety, depression, thought disorders
• Teen health including contraception
• Dietary counseling
• Technology marker projects
  o Telemedicine
  o Communications--internet services
  o Human Machine Interface
  o Access
  o Data Integrity
  o Data Repository
    ▪ Patient access
    ▪ Self service
    ▪ Telemedicine
    ▪ Home Based
    ▪ Education
    ▪ Internet and Intranet access
    ▪ Teen health page (eg. Ortho)
    ▪ Continuing Medical Education
    ▪ Electronic health record
  o Voice delivery systems into care delivery
  o Communications with patients, voice recognition
  o Privacy issues
  o Integration with Nova Scotia communications sector

These projects and additional ones will be fully developed once secure funding is in place. Each project will improve the care of people in Nova Scotia by providing proper evidence when decisions are required and by collecting meaningful information about the results of care. Particular industry groups will have an interest in particular marker projects and will represent additional sources of funding.
**Marker project committees** will recommend the techniques necessary to meet the needs of each project. The Nova Scotia ICONS (Improved Cardiac Outcomes Nova Scotia) and IDEA studies are examples of marker projects and an overall health information system must meet the needs of these projects ICONS project and other projects as well.

The Marker Project advisory committee would have responsibility for identifying marker projects and helping to integrate them into the overall project.

**A Scientific and Evaluation Advisory Committee** will be responsible to ensure the integration of evidence based applications into the overall system and the development and implementation of appropriate evaluation methods.

**A Technology Advisory Committee** would be responsible for ensuring that the tools and technologies which are implemented are compatible with each other, are acquired at appropriate prices using appropriate purchasing methods. The technology group would also be responsible for issues related to the relationship between people and technology since the technologies are meant to improve the overall productivity of our health care system.

**A Communications Advisory Committee** will be responsible for issues related to communications between providers, between providers and the public and for recognizing and implementing technologies to support public and provider education. This committee will have responsibility for the implementation of telemedicine applications - a Nova Scotia priority and for the integration of telemedicine applications into an overall communications strategy.

**WHAT ARE THE PROJECTED BENEFITS:**

Nova Scotia and Canada will benefit from the installation of a comprehensive health care information system which has been developed with collaboration by each of the essential components of the health care industry.

Ongoing evaluation means that the system will have been subject to regular review and correction. Proper objective scientific evaluations will support marketing of Canadian private sector tools abroad.

The system we introduce will provide efficient support to many of the operations of the Canadian health care industry including communication between pertinent components, access to timely health information for individual patients and access to overall population health information. A Provincial Data repository and opportunity to collect pertinent health information will support administrative efforts and other
efforts to improve the overall health of Nova Scotians. The collection of regular information about individual and population health will support efforts to identify superfluous or harmful health care activities.

PROJECT OUTLINE:

ACTIVITIES:

1. **Establishment of a broad based steering committee** including the public relations and stakeholder liaison. This is largely completed. Nova Scotia and National collaborators are prepared to work with us as we develop this large project. We propose to advise the public about this initiative since the public will benefit from improved health care and improved information.

2. **A needs assessment** which will provide information about the current state of decision support in Nova Scotia, opportunities to improve care by using information technology including hardware, software and communications strategies. The vision, leadership and previous work by Nova Scotia's Department of Health will support the efficient completion of this stage and could reduce projected costs for this stage. We will also learn from the experience of others. Efforts such as those of the Washington State Health Information Needs Assessment conducted in 1996 which was one of the most comprehensive in North America, may be incorporated into the structure of the work already initiated in Nova Scotia.

**Benchmarking** other areas where technology has been successfully implemented.

Site visits to include some or all of the following:
- The Wisconsin Health Information Network (WHIN)
- Comox, B.C.
- Greater Dayton, Ohio
- Kaiser Permanente -- Colorado region
- Washington State Health Information Needs Assessment

Other conferences with technology showcase and presentations by Nova Scotia and other private sector developers.

The incremental costs of the benchmarking stage will be the costs of travel. Estimated costs for 3 people to each of the sites and conferences at $2,000/person/meeting is $45,000.
3. **Development of other project committees.** We will form the technology committee, scientific advisory committee, marker project committees and commercialization committee.

4. **Development of a showcase and utilization management conference.** The conference and showcase will be an opportunity to examine how information technology can be used to improve support for providers. The showcase and conference will also discuss ways to improve the use of evidence based care in Nova Scotia and to develop consensus among payers and providers on the most effective and efficient ways to deliver care. This activity is scheduled for June 12-13, 1997 and has been sponsored by the Nova Scotia Department of Health.

5. **Development of the Cooperative Business Solutions proposal** based upon the results of prior components of Phase 1. The CBS proposal will define the necessary communications network, specify information and data to be collected and exchanged, describe hardware requirements, define confidentiality and security requirements, specify reporting requirements and describe all problems that need to be resolved. The CBS proposal will then be distributed to interested parties for formal submission.

**SUMMARY:**

Nova Scotia is determined to introduce modern technologies to support evidence-based health care and has involved a variety of constituencies in furthering those objectives. Federal participation in this process will allow for an expansion of these activities to ensure the creation of a comprehensive health information system which can be utilized across the country to form the national health information system. Federal participation will also facilitate the commercialization of related products to augment the capacity of the private sector in domestic and export markets.

A substantial infrastructure exists within the Province which will collaborate with national resources through HEALNet and the proposed federal government participation to integrate health information tools and technologies to create an advanced health information system which will effectively and efficiently address the requirements for health care in Nova Scotia and facilitate the implementation of a national strategy for the implementation of tools and technology to support clinical care, teaching, administration and research.

**REFERENCES**

14. **Teen Health** a web site developed by medical students at Dalhousie Medical School supervised by faculty (D. Langille, G. Paterson and others).
17. Examples in Nova Scotia include:

**Digital Image Fx Inc.** who is developing three dimensional imaging systems and support for telemedicine applications
**Shared Care Informatics** who are developing concurrent review systems to monitor health status and the effect of various health care activities on health status

**Tecknowledge Healthcare Solutions Inc.** who is developing telemedicine capacity in Nova Scotia

**Concentrics Communications** who are developing communication links between various sectors of the health care industry including providers, pharmacies and hospitals.

**Digital Fx** which is developing a virtual reality patient simulator product and which is also developing important components to support telemedicine.

18. Various HEALNet collaborators are developing evidence based applications including applications encouraging the use of evidence for diagnosis and treatment.

19. Health Canada WWW announcement

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