March 1997

Nova Scotia
Department of Health

Remote Specialist Consultation and Continuing Medical Education Pilot Project

1. Executive Summary

1.1 Overview

The *Remote Specialist Consultation and Continuing Medical Education System Pilot Project* tested the viability and acceptability of using telemedicine to provide specialists services and continuing medical education to rural communities in Nova Scotia. Programs were developed and technology was installed to trial a Continuing Medical Education (CME) program, and a dermatology and radiology specialist support system. The objective was to assess the educational, clinical, operational, financial, and technical viability of the telemedicine application. The project was funded by the Nova Scotia Department of Health and was conducted during 1996.

The telemedicine program tested during this pilot project was found to be educationally, clinically and technically viable. Merging the requirements of education and training, clinical programs and administration requires a program management infrastructure if the pilot project model is to be expanded to an operational system. This will facilitate operational and financial efficiencies which will be system wide, and will ensure long term planning, focus and viability.

Rural healthcare providers and rural patients found the system presented in the pilot project to be both highly acceptable and desirable. One hundred percent of patients who were exposed to the system felt that it was an advantage to their community. Most healthcare providers felt that the system increased their access to education and training resources and reduced their feelings of isolation.

1.2 Background

The goal of this pilot project was to assess the educational, clinical, operational, financial, and technical viability of the application of new technologies techniques in providing continuing medical education and clinical specialist support to rural centers.

This project was conducted as a partnership of:

- Nova Scotia Department of Health;
- Continuing Medical Education Department of the Faculty of Medicine of Dalhousie University in Halifax;
- Cape Breton Regional Hospital in Sydney;
- Guysborough Memorial Hospital in Guysborough;
- Northside General Hospital in North Sydney;
- Eastern Shore Memorial Hospital in Sheet Harbour;
- Queen Elizabeth II Health Sciences Centre Radiology Department in Halifax;
- Queen Elizabeth II Health Sciences Centre Dermatology Department in Halifax;

- TecKnowledge Healthcare Systems of Dartmouth; and
- MT&T in Halifax.

1.3 Continuing Medical Education

A system of providing Continuing Medical Education (CME) from the Dalhousie Medical School in Halifax was tested to a regional healthcare center in Sydney; a small town hospital in North Sydney; and rural facilities in Sheet Harbour and Guysborough. The project began in January 1996 and was completed in June 1996.

Twelve individual programs were developed and broadcast to two of four receiving sites at a time - for a total of 24 broadcasts. There were 332 attendees at the sessions - 269 physicians, and 53 other healthcare professionals. A structured evaluation was done before the pilot program began, after each session, and at the end of the pilot project.

Rural physicians had a high degree of acceptability for this means of attending CME sessions. They highly valued the system as they are more isolated and faced additional barriers to attending traditional CME sessions. It was also found that the sessions fostered interdisciplinary learning and team building within the healthcare team as other team members (nurses, social workers, etc.) were able to attend the sessions.

The small town physicians had a slightly lower degree of acceptability than rural physicians due to the availability of other CME options. They still valued the sessions as they found them more accessible with reduced loss of practice time. The physicians in the regional centre in Sydney had a lower percentage of attendance at the sessions, but still found them acceptable as a means of accessing CME.

Session presenters found the system highly acceptable as a means of conducting CME sessions. It was strongly felt that the interaction between faculty and participants was effective and valued.

An assessment of the operational costs (room rental, long distance, conferencing bridge, etc.) of conducting sessions via videoconferencing showed the costs were less than those of the traditional visiting professor sessions.

The overall conclusion was that this technology is a very viable means of providing CME - particularly to rural sites.

1.4 Radiology

A system of providing x-ray interpretation from the Queen Elizabeth II Health Sciences Centre in Halifax to rural facilities in Sheet Harbour and Guysborough was tested. The technical and clinical evaluation phase began in January 1996, with the operational phase beginning in September 1996 and concluding in December 1996. Both scheduled and unscheduled interpretations were part of the program.

In the technical and clinical evaluation the system was found to meet the teleradiology guidelines published by the American College of Radiologists (ACR), and the Canadian Association of Radiologists (CAR). Films were digitized by a scanner at the rural sites. The digital files were transmitted to the QEII radiology department via a network and were interpreted by the radiologist on a gray-scale monitor. A total of 548 film interpretations were conducted for Guysborough and 260 for Sheet Harbour.

To determine the diagnostic accuracy of the system, a proportion of the original films were read and the reports compared with those for the digitized images read during the pilot study. This "double-read" comparison process was to determine the degree to which image detail was lost or changed in the digitisation, transmission and image re-creation processes. Double reading of films showed differences in 4.3% of cases.

The second phase of the comparison study required re-reading of both the digitized images and the original films for those examinations for which discrepancies were found. The purpose of this phase was to determine if the identified discrepancies were caused by loss of detail or changes attributable to the digitisation process, or if they were caused by other factors - such as reader error or reader variation within normal limits.

A total of four discrepancies of 352 double-reads were noted between the digitized image and the original radiograph. In two of these cases the diagnosis was unaffected by the loss of detail. In another the digitisation actually appeared to accentuate (or enhance) the lesion image rather than to blur it. The other discrepancies were concluded to be due to reader variation in interpretation of minor details which would not affect diagnosis.

Thus the number of "misdiagnoses attributable to digitisation" was four. This represents a rate of variation of 1.1%. Using binomial probabilities, at a 95% confidence interval for the rate in the underlying process, the rate of variation in the underlying process is no higher than 3%, given that the observed rate variation rate was 1.1%.

The consulting radiologist believes that teleradiology is a reliable and accurate means of conducting routine radiological examinations. It was determined that a second high resolution monitor would make comparison of current and previous films more efficient and effective, and that image viewing should be to a 12-bit depth to increase the number of shades of grey available. It was also noted that the quality of the original films affects the quality of the interpretation, so a quality assurance program would have to be implemented at all teleradiology sites.

In general , rural physicians and x-ray technologists found this system acceptable. At one site, patient reports were generally received sooner.

Five emergency cases were received during the pilot. In three of these, the immediate response of the radiologist resulted in the patient not being transported to the regional healthcare facility for further assessment. This resulted in considerable reduction of the stress to the patient, the patient's family and to the

rural healthcare providers treating the patient. This also resulted in a cost savings of ambulance transport costs, and possible reduction of hospital admission and inpatient days.

In summary, rural access to routine radiology services would be improved by use of a teleradiology service. This is very dependent on the particular circumstances of a rural facility. In emergencies, access to radiological consultation is seen to be increased substantially. This will have a substantial affect on both the patient and rural healthcare provider, and will reduce the costs of emergency transport. Further savings could be realized in reduction of patient admission and inpatient days.

1.5 Dermatology

A system of providing access to dermatology diagnostic services from the Queen Elizabeth II Health Sciences Centre in Halifax from rural facilities in North Sydney, Sheet Harbour and Guysborough was developed and tested. The project began in May 1996 and concluded in August 1996. A scheduled Teledermatology Clinic was conducted at each rural site and unscheduled dermatology services were provided upon request.

Sixty-six consultations were conducted under this program - fifty-five new patients, and eleven return visits. There were eighteen patients from Guysborough, fifteen from Sheet Harbour, and twenty-two from North Sydney. Twenty-eight of the patients were female and twenty-seven were male. Ages ranged from 18 months to 89 years, with eleven patients under the age of 16 years.

Forty-one different diagnoses were made. Four of the fifty-five patients were seen in follow-up office visits. At the traditional visit the telemedicine diagnosis was confirmed. Seven of fifty-five patients were requested to have skin biopsies performed. Three of the seven biopsies confirmed that the teledermatology diagnosis was accurate. One of the seven confirmed that the diagnosis had been included in the original differential diagnosis. Two were over-diagnosed as possible skin cancers but were found to be benign. The final biopsy condition was unknown at the time of this report. Five of fifty-five patients were requested to have blood work. Three of the fifty-five patients had to travel to Halifax for patch tests. All of these investigations would have been requested if the patient had been seen in the traditional office consultation.

Five patients were seen under unscheduled or urgent conditions. The health care status of these patients was improved dramatically as a result of being seen within 24 hours.

The dermatology specialist concluded that this is a satisfactory way to see patients and that patient-physician communication was not compromised. It was also determined that the accuracy of diagnoses (confirmed by biopsies, blood work, patch tests and "live" visits) was similar to the accuracy of "live" consultations.

The referring physician in the rural communities also had a high degree of acceptability for the teledermatology clinics. All agreed that this service was of value

to physicians in rural practice, and that attending the consultation provided valuable CME.

There was a high degree of patient acceptability, with one-hundred percent of patients stating that this service was of value to them and their community. Patients also felt that patient-physician communication was not compromised in visiting the specialist in this manner. Rural patients felt that this was a cost savings for them - as they did not have to travel to Halifax. In addition, most patients felt that this contributed to their overall health as they were able to access services in a timely and less stressful manner.

1.6 Technical Assessment

One of the objectives of this project was to assess the capabilities of the technology and telecommunications in providing CME and clinical services. In particular, this pilot project was to assess the ability of a multipurpose telemedicine workstation in:

- presenting the participants with enough information to learn from broadcast CME sessions, and
- presenting specialists with sufficient diagnostic quality information so that they are able to assess a patient's condition and make recommendations as to a patient's care.

The rural systems were based on computer technologies integrated with high performance videoconferencing. All sites found the videoconferencing easy to use once training of users was undertaken at each site. Using the system, all users were able to successfully participate in CME and in the teledermatology clinics with minimum difficulty.

It was determined that the systems must be designed to be very rugged and easy to move around the facility and set-up. The system components - monitor, camera, microphone and speakers - must be of high quality to present the participants with the most realistic images and sounds. Lighting, room setup and background colours were found to be significant factors in successful conferencing - particularly in clinical situations. This was found to influence the degree of acceptability of the system by both patients and clinicians.

The user interface must be simple and intuitive as most users were not frequent users, and many were not highly computer literate. During the pilot project, workflow processes were determined and automated where ever possible to reduce the number of steps required to perform a task.

In teleradiology, management of the digital information is an issue which requires careful assessment and planning before system implementation. The pilot project did not test storage and archiving of information for future retrieval, and management of the technology (i.e. computer storage and communications) was a significant effort for all involved. Future systems should carefully assess memory, communications and display requirements.

Overall, the system was found to be technically viable. The installation of a single multipurpose telemedicine workstation was found to be a viable option for provision of education and clinical services. In addition, it should be noted that the same workstations could also be used for administrative purposes (i.e. meeting, interview, etc.).

1.7 Operational Assessment

The system was also assessed for operational viability in the rural communities. In each of the programs, requirements for operational and support resources were assessed. Also, as these were multipurpose workstations, the need to manage inter-program requirements was determined.

Over the year long pilot project it became clear that any telemedicine program must be managed in a program management infrastructure to ensure most effective and efficient use of the technologies and the clinical and support resources. This is particularly important to the rural facilities who will have a single access point to the system.

In all phases of the pilot project it became evident that technical and administrative support was necessary for the programs to flow smoothly. In particular:

- CME - support was needed to book session rooms, the conferencing bridge, prepare and circulate advertising, and to set-up equipment and facilities;
- teleradiology - support and structure was needed to manage patient information, planning and scheduling of specialist support and consulting resources, and management of the technology and telecommunications; and
- teledermatology - support was needed to manage patient booking, and system scheduling and set-up at all sites.

The program management infrastructure recommended includes a Telemedicine Advisory Board and Telemedicine Management Team. The Telemedicine Advisory Board would be responsible for endorsing the strategic plan, approving policy and ensuring effective key relationships. The Telemedicine Management Team would provide the overall management structure and facilitate the implementation and coordination of telemedicine programs.

1.8 Financial Assessment

Costs of a telemedicine program are relatively easy to identify and rationalize, but cost savings are difficult to both identify and estimate. This pilot project demonstrated that justifying the total costs of implementing a telemedicine program from operational savings alone will be difficult. Using technologies which are multipurpose shares the fixed costs among a number of educational and clinical applications.

The actual costs of the pilot project were divided into project costs (those associated with the management of a pilot project) and program costs (those associated with

an ongoing telemedicine program). In assessing the viability of an operational telemedicine program, the project costs for this pilot project were not considered.

It was found that that variable operational costs of providing CME using videoconferencing technologies were significantly less than those of providing traditional CME programs. This did not include the savings to rural physicians and facilities by reducing the requirements for travel and time away, or the capital and fixed operating costs of the workstations. Using the pilot project model (2 receiving sites per session), it was found that twelve CME sessions per site would need to be held per year to recover 25% of the capital and fixed costs of installing this system in a rural facility. As it is estimated that a minimum of 5 sites per session would receive CME, the operational savings per session would increase as the program expands.

The operational savings realized in providing teleradiology services were found to be relatively small in comparison to the capital and fixed operating costs of the service. Using the model provided in the pilot project, a significant number of emergency admissions or transports would need to be avoided to recover these costs. It is difficult to estimate the overall financial impact of providing more rapid turn-around of radiology reports but it is projected that long term system-wide savings would result from more immediate and accurate treatment of patients.

The patient realized the largest savings in the teledermatology services. This was due to reduced requirements for travel. Using the pilot project model, the estimated costs of providing a two hour teledermatology clinic were estimated at $33.70 for the consulting institution, and $159.70 for the referring institution. This included an estimate of the amortized fixed costs of the workstations.

A telemedicine program effectively moves the provision of clinical services from an urban community to a rural community. This will have a financial impact on the rural community and the healthcare facilities in those communities. It is difficult to determine the savings that will result from more immediate response to clinical problems, and better access to specialist services by rural patients. This should improve the health status of those communities and reduce the overall long term healthcare costs.

1.9 Conclusions

The pilot project was successful in its goal of assessing the educational, clinical, technical, operational and financial viability of a telemedicine program in providing support to rural communities. The telemedicine program tested during this pilot project was found to be educationally, clinically and technically viable. It was determined that an expanded telemedicine program needs to have a program management infrastructure to ensure long term planning, focus and viability.

The major beneficiaries of a telemedicine program were found to be healthcare providers and patients in rural communities. This was due to educational and clinical services delivered directly to the community, instead of the community

members having to travel to access those services. This will improve the ability of those communities to effectively manage their healthcare needs and will assist in improve the health status of the surrounding area.