# Arctic Telemedicine Project Final Report

***Presented to the Sustainable Development Working Group of the Arctic Council***


Prepared by

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**This project would not have been possible without the Arctic Council's twelve identified key contacts for telemedicine:**

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## Participants of the 6-7 March 2000 Arctic Telemedicine Workshop Washington D.C. USA

*Photo by Melodie Fair*

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## Executive Summary

Accessing healthcare is a challenge for arctic residents when compared to the general populations of the eight nations making up this polar region. These far northern residents face physical difficulties, which include great distances, severe wind and cold, and extremes in light. These conditions can be demanding on the health of those who travel, and can be harmful to the injured, ill, or infirm.

These remote northern communities face fiscal difficulties, such as limited financial support for staff, equipment, care, and transportation. They also face staffing limitations, in which they have few or no doctors, mid-level practitioners and, in some areas, paraprofessional healthcare providers. Maintaining qualified staff with well-practiced and current skills is a hurdle that health centers must address to provide local residents with access to appropriate care. Remote health-care practitioners, while well trained, are not the specialists encountered in larger facilities.

In order for arctic communities to provide adequate healthcare to its people, there must be a sustainable means of delivering this care at a distance. Telemedicine has been identified as the use of computers, telecommunication, and medical tools that allow physical parameters to be put into an electronic format.

Although telemedicine is part of the larger telehealth concept, and is dependent on systems of telecommunication, it also involves tele-education and other distance delivery systems. The services that are needed and are being delivered at a distance are defining these remote arctic cities and villages as the "tele-community."

Not only do existing programs need to be assessed, but specific service needs for distant delivery also need to be identified. At the Arctic Telemedicine Workshop in March 2000, Dennis Tiepleman of the Inuit Circumpolar Conference summed up many issues in the dynamic technological and healthcare environments by stating, "Telemedicine is a work in progress."

Key contacts from each of the eight Arctic Council member nations and each of its four Permanent Participant indigenous peoples' groups provided insights and comments for the development of this report to Ministers (see the inside cover page for a list of the key contacts). Section VII presents the primary Issues or concerns identified by the key contacts. The following conclusions have been drawn and are explained in detail in Section VI:

- Telecommunications in the Arctic should be in place to support efforts for telemedicine. If systems are in place, affordable, and reliable they will be utilized for healthcare delivery.

- Health professionals working in the Arctic need to be trained to fully utilize the telemedicine tools that are or will be available to them in the communities they serve.

- New endeavors in the field of telemedicine in the Arctic should place a priority on the "front end" users in the most remote and under-served communities.

- Efforts to inform the arctic public on telemedicine programs and services should be initiated to gain greater acceptance for the values of quality distance delivered healthcare. In addition, this effort should raise the awareness of healthcare system administrators and managers in the various telemedicine tools available to meet their identified service needs. These efforts should also incorporate local and cultural practices.

- Telemedicine systems used in the Arctic should be spatially and temporally interoperable, and based on guidelines established in various existing international forums (such as the International Medical Informatics Association).

- Arctic programs should make use of the virtual meeting place provided through existing technologies, thus reducing the need for physical travel. Virtual conferencing can be utilized to identify needs, develop programmatic strategies, plan discussions, and organize structures.

- Arctic Telemedicine should consider being closely linked to the efforts of the Emergency Prevention, Preparedness, and Response (EPPR) Working Group of the Arctic Council.

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## I. Overview

In September of 1996 the eight nations of the far north agreed to work together as an Arctic Council and build upon the successes of the 1991 Arctic Environmental Protection Strategy. A priority was to learn more about the components of sustainable development in arctic communities. Another priority was to share information on successful endeavors and ways to avoid problems experienced by others. (More information on the Arctic Council and its activities can be found at their web site: http://arctic-council.org).

In an effort toward understanding health delivery in the far north, the Ministers of the Arctic Council approved a Sustainable Development project on telemedicine in 1998. This initiative was put forward by the United States of America at the request of the State of Alaska. The Institute for Circumpolar Health Studies, at the University of Alaska Anchorage, has facilitated and coordinated this international Arctic Telemedicine Project.

The intent of the Arctic Council's Telemedicine Project has been to share information about the programmatic successes and lessons that have been learned from national and international experience. In addition, the objectives were to identify the following:

- Problems faced and solutions employed, (Sections II & VII)
- Potential applications for the variety of telemedicine technologies (Sections IV & V), and
- Issues that could be addressed by the eight nations of the Arctic Council, and thus allow these nations to work in concert toward solutions (Section VI).

### A. Key Contacts

At the May 1999 Sustainable Development Working Group meeting, each of the Arctic nations' Senior Arctic Officials was asked to identify a key national contact for this project. In addition, the four Permanent Participants (indigenous peoples' organizations) of the Arctic Council were each asked to supply a key contact to participate on their behalf.

The key contacts of the project are well versed in past, existing, and potential telemedicine programs. These contacts participated in a series of document reviews via e-mail, in which they established a list of primary issues in the field of telemedicine. These primary issues became the working agenda for the Arctic Telemedicine group, and have evolved into the recommendations of this report.

The United States placed a draft version of this report on the Arctic Council web site for public comment. It contained access information for each of the key contacts. This allowed anyone who is interested in Arctic Telemedicine to contact the most appropriate person for additional information. It is intended that once officially received by the Arctic Ministers, this final report will continue to be available on the

Arctic Council web site as a source of information on this sustainable development project.

## B. Information Collection

The key contacts were asked to provide existing summaries or reports about their telemedicine programs, or to provide an electronic version or web site that can provide such information. In addition, they were asked to provide a list of ideas or concerns about how the Arctic Telemedicine Project was outlined or scheduled--as the intent was to conduct as much of the business via e-mail as possible. Lastly, the key contacts were asked to provide a list of important telemedicine issues they wished to see addressed, as well as to include why these issues were important and what factors may be critical to discussing them. (See the summary document in the Ideas, Issues, and Sources of Information - Section VII.)

The Institute for Circumpolar Health Studies reviewed the individual reports to identify a list of common concerns and practical solutions. The primary items that were identified were circulated to the key contacts. It was expected that each key contact would have his/her own group of co-workers or resource personnel with whom he/she shared the materials and gained commentary. Through the electronic exchange of materials and ideas among the key contacts, priority issues in Arctic Telemedicine were identified. This dialogue took place throughout early 2000. The key contacts were asked to provide additional written materials on new or developing telemedicine programs in their nation or group. The agenda for discussing an active international telemedicine discussion evolved from this exchange.

From the materials provided and the discussions that followed, a draft report was prepared for public commentary. Seven recommendations (Section VI) were proposed and reviewed. Additional programmatic documents were provided by the key contacts that assisted in clarifying some of the aspects underlying the recommendations that had been proposed. The comments and new materials were compiled into this final report for the Arctic Council Ministers.

## C. Report to the Ministers

The US Department of State provided funding for the key contacts to participate in a face-to-face meeting in Washington DC on 6 and 7 March 2000. This Ministerial report is built upon the discussions held at that meeting. The preliminary Arctic Telemedicine report to the Ministers was circulated first to the key contacts for comments. They also had the opportunity to circulate it among their co-workers for broader assessment.

In addition, the draft was circulated at the 26-28 April 2000 Senior Arctic Officials' meeting so that the Arctic Council, the Council's Observers, and the public were made aware of the process, findings, and proposed recommendations. The draft report and its recommendations were also presented during a special session on telemedicine at

the Eleventh International Congress on Circumpolar Health. This presentation provided an opportunity to share the preliminary findings as well as to provide for a broader discussion of northern telemedicine issues. The session was held during the first week of June 2000 in Harstad, Norway. Several of the key contacts were able to attend and present at this session.

Public comments were accepted on the draft report until the end of June 2000, and requests were made for additional information from key contacts. The coordinator then prepared a final draft version of the report during July 2000. The revision was based on the following:

- Materials provided by the key contacts,
- Electronic review of ideas,
- Discussions of issues, and
- Public commentary on the draft.

The key contacts had one more opportunity to review the final version of the report during early August 2000. The completed document will be presented to the Senior Arctic Officials and the Ministers at the Arctic Council meeting in October 2000 in Barrow, Alaska.

The Arctic Council's Telemedicine Project was designed to develop a report based on the insight and advice of a small group of knowledgeable individuals. This has been done largely through e-mail exchanges, with only one formal in-person meeting. Telemedicine is a specific application of telecommunications. The Arctic Telemedicine Project has been designed to expand the ability to work throughout the Arctic via technology. It is expected that once the virtual expert committee process has been demonstrated, it will be replicated.

Within the telemedicine community, it is anticipated that this process will provide the impetus to continue to provide regular international communications for the improvement of health in the Arctic. One of the recommendations from this endeavor is that a virtual telemedicine workplace be established to foster and sustain the sharing of information on the latest technologies and on the solutions needed to make telemedicine an integral component of remote arctic healthcare.

## II. Project Schedule

April 1999: Contract established between the State of Alaska and the Institute for Circumpolar Health Studies of the University of Alaska Anchorage to conduct the Arctic Telemedicine Project.

May 1999: Coordinator presents a general scope of work to the Sustainable Development Working Group of the Arctic Council, and requests key contacts be identified.

June 1999: Detailed scope of work with time schedule prepared.

September 1999: US Department of State establishes a contract to support a workshop for the key contacts of the Arctic Telemedicine Project.

October 1999: Coordinator distributes first message to the key contacts, confirming participation and requesting copies of existing telemedicine reports and other information.

17-18 November 1999: Coordinator reports on the progress of the Arctic Telemedicine Project at the Arctic Council's Sustainable Development Working Group in Washington, DC.

19 November 1999: Due date for preliminary information submitted by key contacts. Coordinator begins initial review.

December 1999 – February 2000: Coordinator continues to gather and circulate information on arctic telemedicine programs, and fosters electronic dialogue among the key contacts to determine primary telemedicine issues that need further discussion.

6-7 March 2000: Arctic Telemedicine Project workshop held in Washington, D.C. Key contacts discuss the primary issues and come up with draft recommendations for presentation in the Ministerial report.

26 March 2000: Coordinator prepares the preliminary draft Ministerial report and delivers it to the US Department of State to be included in the packet of information that will be distributed to the Senior Arctic Officials. Report is also circulated to the key contacts for review and circulation among co-workers for commentary.

26-28 April 2000: Coordinator presents the preliminary draft Ministerial report on Arctic Telemedicine at the Fairbanks' Arctic Council's Sustainable Development Working Group meeting for review and comments.

4-9 June 2000: Coordinator presents and discusses the preliminary draft Ministerial report on Arctic Telemedicine at the 11th International Congress on Circumpolar Health in Harstad, Norway.

30 June 2000: All comments on the preliminary draft Ministerial report are due to the Coordinator.

July 2000: Coordinator prepares the final draft Ministerial report on Arctic Telemedicine.

By the middle of August 2000: Key contacts make last review and comment on the final draft Ministerial report on Arctic Telemedicine.

31 August 2000: Coordinator completes the final Arctic Telemedicine Project report to Ministers and submits it to the US Department of State to be included in the packet of information that will be distributed to the Senior Arctic Officials.

October 2000: Coordinator presents the report on the Arctic Telemedicine Project at the Arctic Council Ministerial meeting in Barrow, Alaska.

## III. Discussion

The first message reportedly ever sent via a telephone was a call for help. Over 120 years ago Alexander Graham Bell spoke a plea into the mouthpiece after spilling battery acid on himself while testing a new transmitter described in his recently received first telephone patent. His assistant, in a distant room, heard the now famous message from the receiver; "Mr. Watson, come here. I want you." Watson rushed to provide aid, and in the process confirmed that the system worked. A few years later, radio was being used in polar telemedicine as well. Radio healthcare messages were sent to remote camps in Antarctica as early as 1913 (Lugg 1999). Telecommunications and telemedicine have and will continue to be intimately linked.

Clearly the delivery of healthcare will utilize any existing telecommunication system that is available, to the best of its ability. When there is a means to communicate, people historically have put it to use to help one another. As long as there is a point where the message begins and a point where it can be received then practical information can be exchanged. The remote areas of the world are faced with less access to many systems of telecommunications. It follows then that in these remote areas healthcare may not be as comparable as in areas that have sophisticated communication systems.

When the first facsimile machines made it to the Antarctic and the Arctic, they were used to transmit the strips of information that had been recorded from EKG machines documenting the function of a patient's heart. At the time there was no way to send the signal directly, but the lines traced on paper could be digitized and sent. Recently, northern health staff used their personal digital camera to photograph x-rays hanging before a sunlit window. Those digital images were sent as an e-mail attachment to a distant hospital for interpretation. The creativity of northern healthcare professionals has been applied to exchange information effectively and efficiently. However, such services can only be initiated if the patient can get to the health provider.

Accessing healthcare is a challenge for arctic residents when compared to the general populations of the eight nations making up this polar region. These far northern residents face physical difficulties, which include great distances, severe wind and cold, and extremes in light. These conditions can be demanding on the health of those who travel, and can be harmful to the injured, ill, or infirm.

These remote northern communities face fiscal difficulties, such as limited financial support for staff, equipment, care, and transportation. They also face staffing limitations, in which they have few or no doctors, mid-level practitioners and, in some areas, paraprofessional healthcare providers. Maintaining qualified staff with well-practiced skills is a hurdle that health centers must address to provide local residents with access to appropriate care. Remote health-care practitioners, while well-trained, are not the specialists encountered in larger facilities.

In order for arctic communities to provide adequate healthcare to its people, there must be a sustainable means of delivering this care at a distance. This concept has been identified as telemedicine.

Although telemedicine is part of the larger telehealth concept, and is dependent on systems of telecommunication, it also involves tele-education and other distance delivery systems. The services that are needed and are being delivered at a distance are defining these remote arctic cities and villages as the "tele-community."

Not only do existing programs need to be assessed, but specific service needs for distant delivery also need to be identified. At the Arctic Telemedicine Workshop in March 2000, Dennis Tiepleman of the Inuit Circumpolar Conference stated, "Telemedicine is a work in progress."

Key contacts from each of the eight Arctic Council member nations and each of its four Permanent Participant indigenous peoples' groups provided insights and comments for the development of this report to Ministers (Section VII). The recommendations and conclusions (Section VI) have been distilled from the discussions and documents provided by the key contacts.

For many children and youth, health concerns have been not only an interest but a target for telemedicine. Canada has showcased its work in the distant delivery of prenatal care in its programs. "Telehealth in Canada - Breaking Down Barriers of Distance and Access" is a video that focuses its message on services to prenatal care in remote Arctic areas. The United States efforts in its Arctic have looked for ways to better service infants and children with ear infections.

Prenatal care has been the focus of broad health services in Iceland for years, as they have taken on the philosophy that healthy babies become healthy adults. Telemedicine appears to offer advantages to the very young who cannot travel from home to distant health services by themselves. It is disruptive to entire families if a child and a parent have to leave home for several days in order to see a doctor in a distant city. Traveling with a sick infant a short distance can be a challenge, but extended trips can be detrimental to the child as well as exhausting to the parent.

Access to services in remote arctic communities for children and youth is seen as a major advantage of telemedicine. Likewise, the ability for the old, the infirm, or the critically injured to avail themselves of care without the additional burden of lengthy travel is a significant health benefit. Increasing the access of arctic residents to healthcare is a major contribution of telemedicine. It is also a concept that has been discussed for decades.

A review of historical materials and publications support the ideas that are presented in this report. For over thirty years circumpolar health professionals have met to discuss the issues of the people of the far north, and how to improve distant delivery of services. These professionals formed the International Union for Circumpolar Health

(IUCH). A chronological listing of papers that address the concept of telemedicine or remote healthcare that incorporates the use of telecommunications is located in the Report Citations and References (Section VIII) of this document. These papers were published through the proceedings of the triennial International Congress for Circumpolar Health (ICCH).

The IUCH has reported over thirty years of discussion regarding the link between healthcare delivery and the quality of telecommunications in the Arctic. The ICCH papers also reinforce that, although pilot studies and trial programs have been supported, plans to bring communities into the available communication systems, and to make telemedicine an integral part of daily healthcare delivery, have not been fully realized.

## IV. Findings

Four general areas have been identified and must be addressed in concert in order for telemedicine to be a sustainable feature in arctic communities:

- Physical Infrastructures
- Training Structures
- Interoperability Guidelines
- Community Interface

### A. Areas of Telemedicine

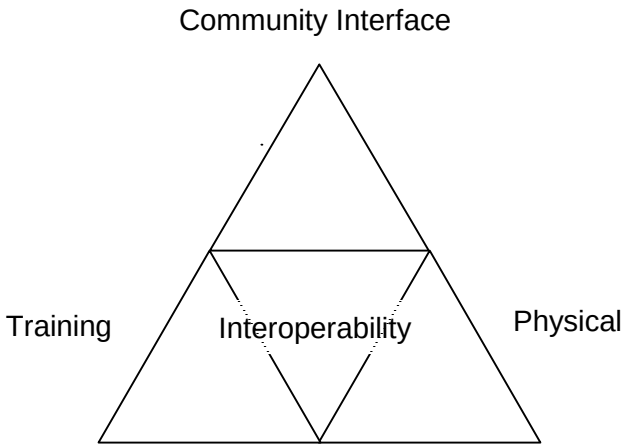
Physical Infrastructures - This area of the telecommunication system includes the hardware and software as well as supporting facilities. It is the basis upon which any current telemedicine program is supported. There cannot be telemedicine without the lines, the transmitters and receivers, the stable power sources, the stable heating systems for the clinics, and the equipment to transfer physical health parameters into digital or analog electrical formats for transmission.

Training Structures - These are the health and medical training programs that incorporate the full utilization of the latest technology as part of daily clinic operations. Distance delivery of training programs will provide well-focused continuing education and skill development for remote health professionals. This enhances health delivery capacity at remote sites, then expands the utility of telemedicine programs.

Interoperability Guidelines - These are the guidelines that are being developed under the auspices of other international forums to assure that health practitioners, and the electronic tools they utilize, will function in either the same language or at least a language that can be understood by the receiver.

Community Interface - This is the cutting edge in addressing how the larger healthcare system, in all of its sophistication, can be utilized effectively and efficiently by local providers for the maximum benefit of remote arctic residents. This area incorporates local and cultural practices as well as identifies community needs and abilities.

These general areas can be arranged in a pyramid of four connecting triangles. The physical and training structural components make up the foundation. The interoperability guidelines of the systems are in contact with the other three components and are placed centrally. The top component is the community interface.




## 1. Physical Infrastructures

This area of the telecommunication system, which includes hardware and software, makes up the basis upon which a telemedicine program is supported. There can be no telemedicine without lines, transmitters and receivers, stable power sources, stable heating systems for the clinics, and the equipment to transfer physical health parameters into digital or analog electrical formats for transmission.

These hardware and software structures can take physical health parameters and put them into a digital or analog format that can be sent electronically to any location. They must work at a remote arctic site (perhaps even as a mobile unit), and meet the informational diagnostic needs of a specialist in some distant location. In addition, the physical structures must be usable by individuals who have minimal medical training. Arctic communities are in need of the best available technology that provides the greatest quality and utility, while having the lowest initial and recurring costs.

In the past, the physical structures were based on radio. Even today single side band radio is used to communicate from mobile or remote sites. Public radio stations provide one means of getting health-related messages across the miles. However, reports indicate that even basic radio transmissions that were part of the healthcare system of the former Union of Soviet Socialist Republics are no longer used in remote areas of Russia.

While better telecommunication systems are in place in many areas of the world, the Arctic has limitations. For example, the aurora borealis has been consistently reported to interfere with radio and radio telephone transmissions. Satellite positions are

generally low on the arctic horizon and, during some periods of the year, move directly in front of the sun for hours, preventing clear communications. Weak satellite connectivity (a weaker signal reaching the ground due to the curvature of the earth) also requires larger satellite dishes that are expensive to ship, install, and maintain in remote locations and in severe weather. Mountainous terrain can inhibit the use of some communication systems. In addition, transmitters and receivers are often exposed to extreme winds, cold, and heavy frost and snow, causing a degradation of the ability for communication systems to carry accurate information.

Reports conclude that, as telecommunication systems improve in remote arctic regions, many forms of distant delivery services will become more sophisticated. There is a parallel example in the experience of healthcare services in the Antarctic. The application of telemedicine in the region of the South Pole has followed the pattern of improved telecommunications, followed quickly by advances in telemedicine. "The time-honored approach…has been for [tele]medicine developments to be introduced as communications become more sophisticated" (Lugg, 1999). Therefore, without reliable physical infrastructures there cannot be regular telemedicine programs. Likewise, it follows that, as telecommunications improve, telemedicine will be utilized to the level of the development of the technology, and healthcare will advance.

## 2. Training Structures

This area of telecommunication is made up of the health and medical training programs that incorporate the latest technology for daily clinic operations. Information cannot be sent out for interpretation unless there are systems that can transfer physical health parameters into electronic messages. In order for telemedicine to take place, healthcare providers must be trained to utilize the electronic tools to assess a patient's condition. Many anticipate that this component of telemedicine will become part of regular curricula in the health fields. Currently, however, there is a general lack of understanding and utilization of the telemedicine equipment being placed in remote arctic health facilities.

Training structures are linked to physical infrastructures by the way information flows in both directions. As skill levels change, there is less dependence on particular external sources of information. As the telecommunication systems become more advanced and distance delivery of training improves, then there is a reduction in the cost of providing well focused continuing education and skill development for remote health professionals. Telemedicine can be used to expand the ability of remote personnel to provide specific healthcare services. This transfer of competence was demonstrated in western Alaska when telemedicine consultations for dealing with ear infections decreased as local providers became more confident in providing the services on their own and without the need of distant experts.

Training via distance delivery provides a greater level of flexibility, since students can participate when they have time, and are not required to attend classes or pre-

recorded lectures. Distance delivery training is also more cost effective since training can take place on site; it is not necessary for substitutes or replacement staff to be hired when the individual leaves the community for continuing education training. In addition, costs for patient travel can be reduced since follow-up visits can be done remotely, which also affords the local provider with a wider level of training and experience.

Continuing education credits for health professionals can be secured locally through distance delivery of course work. Such programs can enhance the retention of health professions in remote areas, since staff are required to maintain a particular level of proficiency. In addition to on-site training, remote healthcare providers can provide consultations as team members to expand the number of cases they handle. Likewise, external technical and clinical experts can monitor the quality and types of health services provided and use this information to target appropriate training for remote healthcare workers.

Training can take many forms. Educational materials can be targeted to meet work flow needs. They also can be designed to be flexible, allowing easy utilization by remote healthcare providers. If telecommunication systems have the ability to deliver consultations and distance delivery education, the overall scope and utility of the programs will increase. As healthcare staff begin to use new technical tools for daily in-clinic services, there is the added advantage that this information will be provided in an electronic format that can be sent off for distant consultation as needed. The same information can be retrieved at a later time for training as well. Telemedicine tools must become regular components of the health service training of individuals working in remote arctic communities.

### 3. Interoperability Guidelines

Interoperability guidelines are being developed by international forums to assure that the electronic tools that health practitioners utilize will function in either the same language or at least one that can be understood by the receiver. The International Medical Informatics Association is one international group that has worked in this field for decades. Interoperability guidelines should be applied throughout the Arctic.

Although there is a need for an agreed upon process for transmitting secure health information, there is also a need for consistent diagnosis and patient assessment. It is also necessary to have general guidance in data record format development, and to have the ability to move data adequately so it can be utilized as needed by the receiver. This falls into two areas identified as Clinical and Technical.

**Clinical aspects** include the health or medical coding of the patient's condition. If this is done in an agreed upon numeric process, language barriers will be less of an issue. In addition, agreed upon protocols for the utilization of telemedicine consultations may be established

**Technical aspects** include Informatics issues that address the format of files and patient records so they can be easily and securely exchanged. These are closely linked to some of the clinical aspects that need to be considered.

The Technical aspects can also include information on equipment that is known to function after exposure to low temperatures, has low maintenance or calibration costs, or fits the special physical conditions of target populations. Technical aspects can also include systems that share a "language" that has a broad application, such as plug and adapter specifications that allow simple interchange or connection of attachments.

Likewise, it is important for current electronic data management systems to operate with previously stored materials (backward compatibility), and to be able to support programs in the future. This temporal and spatial exchange of electronic materials is key to the sustainability of telemedicine. There needs to be integration between new telehealth systems and existing health delivery structures in the remote arctic.

Another aspect is the liability concerns of having health professionals providing services across typical service unit boundaries. Health professionals receive their credentials by their field of expertise. Some regions require local certification and do not accept national assessments. Telemedicine allows for services to be provided over much larger areas. Therefore, where one can practice must be clarified and certification appropriately obtained.

There have been numerous telemedicine pilot studies, and the time has come to move into full service. However, there are a number of barriers to deployment. Those who have made this shift into full service can provide guidance to others who are entering the process.

Through collaborative dialogue on deployment of new equipment there may be an opportunity to target technology. That is, if a large number of communities all desire a particular type of service due to equipment infrastructure support, it then becomes financially worth while to make sure that the product is available and reliable. This may also then influence vendor service as well as the physical structures of the overall telecommunication system, since it will need to service the needs of its customers. By working together, ideas can be generated and technological needs identified. This new information can then go to the government agencies, who can place such requirements into the conditions of future grants and contracts so vendors can specifically address the stated conditions. What is learned in the Arctic can and will likely be utilized in other developing areas of the world, and so the benefit will not be limited to the far north.

There is an acknowledgement that the Arctic Telemedicine Project should be closely linked to the Emergency Prevention, Preparedness, and Response (EPPR) Working Group. There are many aspects to the EPPR agenda, which include the coordination of emergency services. EPPR conducts exercises and formalizes the agreements for emergency communications. The ability to exchange the best health information,

community advisories, and patient records are all part of being prepared to deal with international emergencies. In order to accomplish this exchange of information, parties participating in EPPR programs will need to agree upon telemedicine interoperability guidelines.

The recommendation that was developed during the generation of this report was presented to the EPPR Working Group for their consideration in June 2000. EPPR responded by providing a copy of their report "Analysis of Communication & Notification Systems in Place for Arctic Risks - Phase I Recommendations." This report is a compilation of a survey that was conducted in the eight arctic nations. In order for the EPPR to exchange critical information in a timely fashion, the standard forms of telecommunication that are reported are telephone and fax.

The minutes of the June EPPR meeting record the following:

> "It was decided that the Chair together with the secretariat should answer [M]r Hild concerning Recommendation 7. The response should emphasize that even though there is a link between the work on telemedicine and the work of the EPPR, it is narrow and related only to common interest in emergency oil, hazardous substances and radiological response. The telemedicine work is mainly outside the EPPR mandate. Clarification should be made that EPPR has not established any international emergency communication network, but has endorsed the current notification system in nations and between nations. Information on the Arctic Guide and on the Analysis of Communication & Notification Systems in Place for Arctic Risks, Phase I should be given in the answer. The EPPR should offer to have its members notify their emergency response organizations of the telemedicine project. EPPR will discuss at its next meeting the final report of the telemedicine program.

This initial dialogue has been very helpful in determining several aspects of the work for a sustainable development project on telemedicine. **First**, there is documentation on the level of telecommunication utilization for emergency communications. **Second**, there is a definition of the area of communications that may link with telemedicine, but that this is certainly not a large component. **Third**, there will be further review of this report for any additional means to coordinate on telecommunications for emergency events that impact human health. **Fourth**, there appear to be areas for development in assuring interoperability for the adequate exchange of public or individual health information. This fits exactly with the EPPR Phase I Recommendations for regular testing and exercising of these communication systems. These should then be evaluated for improvements and sustainability.

### 4. Community Interface

Community interface addresses how the larger, more sophisticated healthcare system can be utilized effectively and efficiently by local providers, thus providing maximum benefit to remote arctic residents. This area incorporates local and cultural practices as well as identifies community needs and abilities.

Healthcare system administrators and managers play an important role in this interface between the larger system and local providers, and must have accurate information to make decisions on the types of equipment and systems that will best address community identified health needs. Tools that have been successfully utilized for evaluation and needs assessment in remote arctic communities should be made available for broader application.

Training local people, who will be required to maintain and repair the telecommunication infrastructure, is another important aspect of community interface. These skills then become an asset to the tele-community concept and its overall viability. By expanding the services provided, and the level of external support received, the recruitment and retention of trained staff becomes less of an issue for remote communities.

Another aspect of community interface is the development of systems that allow arctic residents access to health information. Public educational programs can provide instructions on where to obtain quality health information on the Internet, and how to access government and academic materials. Often, remote communities may only have one healthcare provider who deals with emergency care, direct services, health education, and follow-up visits. Telemedicine structures within the community should support primary care workers in multiple ways through the single point of the clinic.

Many communities are concerned about behavioral and psychological healthcare in their region. Therefore, telemedicine services designed for these areas need to consider ways to assist in long-term care, counseling, and continued patient evaluation. The physical health aspects of telemedicine need to be linked and integrated with other community based social health programs. Telemedicine equipment must not focus solely on clinical applications, but must be able to respond to the need for services throughout the community. This is occurring with psychological evaluations in jails and prisons, as well as for public health nurse home visits--all via video-telephone links. Even thirty years ago it was anticipated that videophones would be a worthwhile tool for behavioral health services in the remote arctic.

Due to the cultural diversity of the arctic population, consideration must be made to existing local and traditional aspects of healthcare delivery. The "hub and spoke" structures that exist today may not need to be the form of tomorrow's telemedicine support system. Patient comfort in the use of electronic equipment may be different from a more traditional hands-on healing process. Having local providers who may speak a familiar language may become significant "culture brokers," since they interface with the western medical model for services and support. Likewise, specialists from distant care systems may need to know much more about a patient's home, food, and attitudes toward health and life in order to best provide treatment. Saami or Inuit patients, for example, may prefer to have healthcare providers who know their culture or speak their language, even if they are from another arctic nation.

Traditional knowledge of healing and cultural practices may go hand-in-hand with telemedicine in some communities. The need to talk and see someone could influence the types of telemedicine equipment that is put into use. The desire for elders not to be inconvenienced by going to clinics could put a focus on the need for mobile home-visit units that would bring a health provider to the living room of a recovering patient.

While the old and infirm are of concern, there is a particular interest in healthy children. An interest in well babies could mean special virtual pre-natal clinics or distance delivery childbirth classes. Some of the first programs that have been put into action in Canada deal with assuring healthy pregnancies and issues of easy access to healthcare for children. Likewise, a primary program within the first Alaskan telemedicine efforts focused on electronic otoscopes and dealt with ear infections in children.

Community interface must target local health needs through appropriate programs. Local practices and traditions will need to be considered in the development of these activities. The greater the community support for these endeavors the greater the sustainability of telemedicine services will be in the remote areas of the arctic.

## B. Interchange of Information

In order for the four aspects of telemedicine to be approached in a consistent and coordinated manner, there must be a regular interchange of ideas and information. A key component is sharing information about the latest technologies and their applications.

Reports from Antarctica may be one area to investigate as arctic solutions to health delivery are being sought. One recent report concluded that the following key components needed to be considered in telemedicine applications:

- Telemedicine must be linked to the level of telecommunications
- The health staff must be trained on the system
- Patents and staff need to be aware of the systems benefits
- Equipment must be selected to meet the health delivery needs (Lugg, 1999).

These conclusions are quite similar to the arctic efforts, yet are an entire world apart.

While discussion does take place within such forums as the International Medical Informatics Association, and the International Union for Circumpolar Health (IUCH), there is no arctic establishment that focuses on telemedicine. The IUCH publication of its proceedings since 1967 documented the pilot efforts and key components of such telemedicine efforts. These papers offer a collection of lessons learned and directions to be followed (see section IX of this report for a listing). Although ideas continue to be exchanged within the IUCH, a formal structure is not currently in place to facilitate this.

The Nordic Telemedicine Association (NTA) was recently established to help bring five of the arctic nations together to discuss telemedicine issues. The purpose of the NTA is to provide a link to European efforts and other international forums that have been organized to foster this field of discussion. The NTA member states currently have programs that link to their arctic neighbor to the east (Russia), thus expanding their scope to six of the Arctic Council nations. It might be possible for the NTA to expand linkages to its western neighbor, Canada. If that occurred, an invitation to the United States to participate would include all eight arctic nations.

The EPPR Working Group of the Arctic Council is another such structure that has already conducted exercises to assure compatibility among communication systems during disasters. It is therefore a natural extension of their efforts to assess how well health information and expertise are being shared. If healthcare linkages can be made in time of disaster, then similar or identical guidelines should be investigated for application during regular access to the healthcare delivery system.

During the development of this report, conversations with the Chairman of the EPPR Working Group have lead to discussions about a telemedicine component to their activities. In the minutes of the June 2000 EPPR Working Group meeting, section 3.2 reported that Recommendation 7 of the Draft version of the Arctic Telemedicine Project Report was discussed. While it was concluded that telemedicine work is mainly outside the EPPR mandate, it was also concluded that members should be requested to notify their emergency response organizations of the telemedicine project. Potentially, it is these emergency response groups that would be positioned to assess the interoperability of medical and public health information systems.

It was also clarified that the EPPR has not established any international emergency communication network, but has endorsed the current notification systems in nations and between nations. There does exist an Analysis of Communication & Notification Systems in Place for Arctic Risks, Phase I. This document provides for the interoperability of emergency systems on an Arctic wide basis. It is this tool that addresses the concerns voiced in Recommendation 7 of this document. However, for the sustainability of telemedicine, as well as emergency communications, such agreements for interoperability need regular review and exercise. This is where there appears to be a needed link between Arctic telemedicine and the EPPR Working Group.

Another aspect of how telemedicine can be sustained is through the utilization of its infrastructure on a regular basis. It has been suggested by the Swedish key contact that telemedicine systems can be used to provide a virtual meeting place for arctic health professionals. During the development of this report, the Coordinator was contacted through the Alaskan offices of the Northern Forum, who had been contacted by a Swedish researcher interested in developing telemedicine educational tools. The researcher was particularly interested in materials on cold trauma. After a few e-mail exchanges, an idea was developed to hold an international virtual meeting on cold trauma. The idea can now become a proposal to seek support and engage northern

health experts in the field of cold trauma in an interactive telemedicine program on cold trauma.

The concept of seminars, discussions, and virtual meetings, while a recommendation of this report, is already a reality. This report was prepared by a virtual body of key contacts. The twelve key contact people involved, along with their resource personnel, have never all met face to face (see the inside cover page for a list of the key contacts). One workshop was held in Washington DC in which a number of the key contacts participated. Other key contacts were unable to attend, but have still contributed significantly to this endeavor.

The Arctic Council can therefore help sustain telemedicine by encouraging northern virtual meetings and program development. By stating that telecommunications is the preferred medium for report development and editing, systems will be utilized that promote greater distance interface. In areas where video conferencing is not available, those who wish to participate need only travel to a regional center to be engaged and not halfway around the world.

The Arctic Council can work to assure greater access to the levels of telecommunication that enable even the most remote community to pull documents and images from its web site. Interested arctic residents should also be able to make comments and deliver them to working committees. As such virtual discussion develops, then too will the ability to exchange information on northern health concerns and distance education and training, and to generally make northern communities more viable. Not only will such efforts sustain telemedicine efforts, but will sustain health professionals in remote locations, as well as improve any arctic residents' ability to access desired information.

Arctic wide and international information sources provide healthcare administrators with a means of discussing lessons learned and the resources available to them. Linking this information to the existing Arctic Council web site through this report will enhance this sustainable development project and provide easy access for individuals seeking materials on northern telemedicine programs. Maintaining the material on the web site will take some time. However, since the Arctic Council has been established to foster viable northern communities, the process of keeping information current on the web site should become a standard component of the host nation.

This Arctic Telemedicine Report is designed to become part of the sustainable development project on the Future of Children and Youth, since access to healthcare is an important objective. More specifically, maintaining the list of telemedicine key contacts--as a component of distant emergency healthcare response--could become part of the program of the EPPR Working Group. Through linkages within the Arctic Council, and to the international telemedicine community, experts in the north can continue the dialogue as this field develops.

In order for the Arctic Council on Telemedicine to have a sustainable development project, they must build from existing national endeavors. Previous Ministerial directives have urged collaboration as a means to foster partnerships and to keep bureaucratic costs down. The Swedish key contact on telemedicine has proposed a virtual working place for such discussion. Such a site would be secure enough even to discuss patient records.

## C. Telecommunications Infrastructure

While the use of telecommunications and virtual meeting places has contributed to the structuring and development of this report, it is the lack of reliable telecommunications infrastructures that appears to be the most serious concern for the Arctic. Currently, most of the Arctic does not provide access to healthcare that can be linked to electronic health information. Many health clinics in the US arctic, in northern Canada, and in Russia have telephones as the most sophisticated and regular link to advanced medical support. Many remote natural resource utilization sites depend on radio for the transmission of health information. In some parts of Russia, even radio contact has been eliminated as an option for some communities due to damage to existing infrastructure and a lack of maintenance.

Currently, many communities in the Arctic do not have reliable telecommunications of any form. While some areas are serviced with fiber optic cable linked to southern networks, there are areas where no such service is seen as possible within the foreseeable future. There are times when weather, the position of the sun, and activity of the aurora borealis make the use of radio and telephone systems impossible. The consistent and reliable utilization of telecommunications does not exist for a great deal of the arctic region and therefore telemedicine can only be marginally applied.

Without a basic and reliable telecommunication infrastructure, it is impossible to provide a sustainable telemedicine program to northern residents. A multitude of options becomes available once telephone, tele-facsimile, and computer modem access are established. Once physical health parameters are placed into a digital or analog form, and reliable systems are installed for transmission, telemedicine (as it is currently practiced) can be utilized. It is at this point that health administrators and managers must have a clear understanding of their community's service needs, as well as know what telemedicine tools are available and affordable to them.

Telemedicine can be seen as an automobile. The remote arctic is often inaccessible, and does not have a road system connecting it to the larger highways of the south. This is not unlike the telecommunication system that cannot be fully accessed from remote communities. Like sophisticated telemedicine equipment, automobiles frequently have problems in extreme cold or in working well with limited maintenance. Most local residents in arctic regions can handle a snowmobile or all-terrain vehicle (four-wheeler), but not everyone can drive a new automobile and must learn these skills. Healthcare providers, too, must learn to operate new telemedicine equipment that is quite different from the tools they were trained to use. Sports cars do not

function well on uneven gravel roads, so people select four wheel drive trucks that work best in the harsh environment. Telemedicine equipment must also be selected to fit the newly evolving needs and infrastructures of remote communities. At the same time, there are "rules of the road," so even local systems need to be able to function as part of larger networks so information and files can be effectively shared among other health professionals.

## D. Appropriateness of Telemedicine Applications

Telemedicine systems have many components that are designed for various applications. In order to receive the most appropriate components of a telemedicine system, community health clinics must determine their own types of health issues. They can start by answering the following questions:

- What conditions require sending patients out of the community for further care?
- What level of care can be provided within the community by the existing professional staff?
- What new electronic tools can address most cases if the local staff were trained to use them?
- What are the costs of these tools (initial as well as recurring, direct as well as indirect)? What savings in other services would be expected?
- What telemedicine system will the community be linked with, and will all of the components be interoperable?

By answering these questions and sharing relevant experiences with others, health clinics can influence how new telehealth equipment is incorporated and applied in other communities. Information exchange helps programs build off the experiences of others and save time and money.

## E. Ideas for Improvement

The recommendations of this report are explained in Section VI and are based on the need for arctic programs to learn from one another through continued dialogue, and from the four primary areas of telemedicine (physical structures, training structures, interoperability guidelines, and community interface). These seven ideas have been generated by the key contacts and reviewed by others interested in telemedicine in the far north. By promoting these ideas, the Arctic Council can help sustain the health and viability of remote communities. The following ideas are designed to help improve the health of the people of the far north, and can be targeted at future Arctic Council events and its activities:

1. Telecommunications in the Arctic should be in place to support efforts for telemedicine. If systems are in place, affordable, and reliable they will be utilized for healthcare delivery.

2. Health professionals working in the Arctic need to be trained to fully utilize the telemedicine tools that are or will be available to them in the communities they serve.
3. New endeavors in the field of telemedicine in the Arctic should place a priority on the "front end" users in the most remote and under-served communities.
4. Efforts to inform the arctic public on telemedicine programs and services should be initiated to gain greater acceptance for the values of quality distance delivered healthcare. In addition, this effort should raise the awareness of healthcare system administrators and managers in the various telemedicine tools available to meet their identified service needs. These efforts should also incorporate local and cultural practices.
5. Telemedicine systems used in the Arctic should be spatially and temporally interoperable, and based on guidelines established in various existing international forums (such as the International Medical Informatics Association).
6. Arctic programs should make use of the virtual meeting place provided through existing technologies, thus reducing the need for physical travel. Virtual conferencing can be utilized to identify needs, develop programmatic strategies, plan discussions, and organize structures.
7. Arctic Telemedicine should consider being closely linked to the efforts of the Emergency Prevention, Preparedness, and Response (EPPR) Working Group of the Arctic Council.

## V. Key Contact Summaries

### A. Telemedicine in Canada

*Provided by Judith Ross*

In 1997, the Government of Canada announced a $50 million investment to begin developing, in collaboration with the provinces, a national strategy for a Canadian Health Infostructure. There were several aspects to this strategy: the launch of the Canadian Health Network (CHN), the First Nations Health Information System (FNHIS), and the National Health Surveillance Infostructure (NHSI); the establishment of the Office of Health and the Information Highway (OHIH) to provide a focal point for telehealth activities within Health Canada; the creation of the Advisory Council on Health Infostructure (ACHI); and the launch of the Health Infostructure Support Program (HISP).

The Advisory Council on Health Infostructure (ACHI) submitted to the Federal Minister of Health its final report entitled Canada Health Infoway - Paths to Better Health in February 1999. In its recommendations, the Council identified telehealth as a key component in providing integrated healthcare services to Canadians. The Council recommended action to resolve some important issues involved in implementing telehealth, such as the licensure of professionals, liability, reimbursement for telehealth services, and evaluation of telehealth applications.

In addition, the Advisory Council stated very strongly in its report that collaboration amongst key players was essential to the development and implementation of a national health infostructure. That process has begun with the creation of an F/P/T Advisory Committee on Health Infostructure, which is addressing telehealth issues, including interoperability issues.

In 1999, the Government of Canada announced an investment of $366 million in building the Canadian Health Infostructure, thus creating a foundation for advancing telehealth. This funding will be used to expand on Health Canada's initial contributions to the health infostructure.

Steps will be taken to harness information and communication technologies in improving the delivery of healthcare by offering renewed support to organizations engaged in such activities, and addressing issues related to security, personal privacy, system compatibility, and the legal and ethical questions associated with using information technology in healthcare.

The Canadian Health Network (CHN) is a new and growing internet-based network that provides access to the resources of leading Canadian health organizations and international health information providers. The resources identified in this web site are helping Canadians take care of themselves and the people they care about. Health intermediaries have an array of resources on prevention and health promotion. More

information about the CHN may be obtained at:
**http://www.canadian-health-network.ca/customtools/homee.html**

The Health Infostructure Support Program (HISP), administered by OHIH, has provided support for projects aimed at providing, evaluating, or raising the level of awareness of advanced network-based services in areas such as public health, health surveillance, First Nations health, population health information, pharmacare, homecare, and telehealth. Under the Health Infostructure Support Program, six demonstration projects relating to telehealth/tele-homecare are nearing completion. More information about these projects can be found at:
**http://www.hc-sc.gc.ca/ohih-bsi/whatfund/hihsp-intro_e.html**

In 1997, the federal government, through the Health Transition Fund (HTF) and in collaboration with provincial and territorial governments, provided $150 million to support approximately 140 projects which pilot and evaluate different approaches to health service delivery, or which evaluate existing models or approaches. Several telehealth projects received ministerial approval and were funded through the HTF.

One of the projects funded through the HTF is the National First Nations Telehealth Project, which is testing the use of telehealth technology as a means of improving health services access, delivery, and outcomes for five remote First Nations communities. Potential telehealth applications and equipment being tested in these pilot sites are medical imaging equipment (including x-rays, electronic diabetes monitoring, electrocardiograph monitoring, and ear/nose and throat scopes) and audio-visual applications (such as tele-rehabilitation, tele-psychology, and tele-education). Expected outcomes of this project include better access to quality health services; more cost-effective health service-delivery; better patient monitoring; better access to healthcare for people in their own communities; and reduced costs for transporting patients to out-of-community healthcare. The project will also measure the cost-benefit and human impacts of introducing telehealth technology into First Nations communities. The project is being managed by the Medical Services Branch of Health Canada through its First Nations and Inuit Health Programs Directorate, in collaboration with First Nations communities, the private sector and provincial partners. More information about the HTF projects can be found at:
**http://www.hc-sc.gc.ca/htf-fass/english/**

In 1998, OHIH organized a Tele-homecare Consultation Workshop and subsequently released a discussion paper on the use of information and communications technologies in homecare. OHIH has conducted an initial investigation of telehealth activities in Canada. This and other reports about telehomecare may be obtained at:
**http://www.hc-sc.gc.ca/ohih-bsi/tele/index_e.html**

Health Canada's Office of Rural Health provides advice to the department and the Minister on issues related to rural healthcare services and health promotion relevant to rural Canada. This office is the departmental focal point for leading and co-ordinating

initiatives to advance rural health, and acts as the departmental "rural lens" in the development of new, or the review of existing policies, programs, and services.

Rural health researchers, like rural communities and populations, are widely scattered. There is an urgent need to bring them together and to keep them informed about developments in rural health research in all parts of the country in an efficient and effective manner. In order to make rural health researchers better able to serve the health needs of rural Canadians, the Office of Health and Information Highway, in collaboration with the Office of Rural Health, has invited the National Rural Health Research Steering Committee to submit a proposal for the development of a rural health research web site.

The proposed web site will be used to inform rural researchers, rural residents, the general public and researchers in other fields about rural health research in progress and findings of rural health studies. It will also provide an electronic link between rural health researchers across the country with other stakeholders.

The Office of Health and the Information Highway is currently engaged in developing a web-based inventory of Canadian telemedicine projects and initiatives, as well as other information about telehealth in Canada. The Canadian Telehealth Knowledge Management Web Site will be accessible in late spring 2001 via the OHIH web site (see: **http://www.hc-sc.gc.ca/ohih-bsi/menu_e.html**).

## B. Telemedicine in Finland

*Provided by Jarmo Reponen*

As a sparsely populated country, Finland is an ideal area for the implementation of telemedicine. Economical benefits of decreased patient transportation are most obvious in remote areas like Northern Finland and Åland archipelago. Need for the continuous quality improvement is well recognized. Telecommunication infrastructure is well developed up to commercial ATM broadband connections. The public healthcare is of high quality, enabling rational patient care in all levels from primary to tertiary care.

The traditional definition of telemedicine was provided by the Advanced Informatics in Medicine program: "the investigation, monitoring and management of patients, and the education of patients and staff using systems which allow ready access to expert advice, no matter where the patient is located" (van Goor & Christensen 1992). However, the direction of development has moved from individual medical specialty projects towards regional and even national development schemes. The current view puts great emphasis on seamless care from the GP´s office to specialized hospital care and back to home care. Telemedicine, in its broadest context, is seen as involving all information and communication technology (ICT) usage in healthcare. This means that electronic patient record distribution is equally as important target as videoconference consultations or remote monitoring of elderly people.

Telemedicine and ICT in healthcare made a substantial leap forward after the ministry of social welfare and health published their policy paper in 1996. This policy paper also brought new financial resources to the field, and so-called welfare clusters were formed. At the same time, the Technology Development Center in Finland (TEKES) started its Digital media program for enterprises. These two governmental agencies work in close cooperation and in 1998 announced an open tender (so called marcopilot) for areas, which could provide comprehensive services for citizen using the most modern ICT technology in HC. This governmental support and guidance has encouraged the 21 hospital districts in Finland to develop their own telemedicine or ICT programs. In summary, telemedicine in Finland has seen evolution from local projects to national policy.

If ordinary telephone discussions are omitted, teleradiology is the earliest known telemedicine application in Finland. The first published experiments with teleradiology in Finland were made in 1969, when x-ray images were transferred between the university towns of Oulu and Helsinki using the television network of the Finnish Broadcasting Corporation (Authors: Pekka Soila, Pekka Vuoria and Erkki Laasonen) .

In 1983 the Turku University Central Hospital experimented with an in-house teleradiology system using video-grabbing, but image quality was judged insufficient for diagnostic purposes. A field test with a link between a rural health center and a university hospital was started in 1988 in the Tampere University Central Hospital. This system used a better video-grabber and the quality was acceptable.

Clinical teleradiology started in 1989 when the Kuopio University Central Hospital installed commercial systems between central hospitals and the main university hospital. This system was based on a video-grabber and telephone and was suitable only for emergency CT images. This service expanded to five central hospitals, which sent mostly images of neurosurgical cases to Kuopio.

In 1990 the Oulu University Central Hospital conducted a pilot study sending a series of x-ray images from a local hospital to the university hospital using a 2 Mbit/s videoconferencing system. Because of the high costs, this system was not taken into clinical use.

In 1991 two different approaches for digital teleradiology were introduced:
At the Turku University Central Hospital, a high-end teleradiology workstation was built and installed with a laser digitizer, an Unix-workstation, a fixed 64 kbit/s link, and a proprietary software. A 2048 x 2048 pixel image matrix was possible, although mostly only 1024 x 1024 matrix was used. This link was used between two separate units of the hospital.

In 1991, at the Oulu University Central Hospital (OUH), a low-cost digital teleradiology system was developed based on PC computers, CCD scanner, Windows software, and a standard TIFF image file format. A dial up 64 kbit/s one-channel ISDN (integrated services digital network) service was used for connections. Image matrix

sizes varied depending on the scanning area of up to 2000 x 3000 pixels. This mobile solution enabled teleradiology to be tested from two central hospitals--a local hospital and a health center--during the years 1991-92. The system was in daily use between the local hospital and the university hospital until 1996. OUH was the first to introduce clinical in-house digital image network, which was built between radiology, radiation therapy, and neurosurgery.

Oulu University Central Hospital started a pilot study of international teleradiology with Nordic links to University Hospitals in Reykjavik (Iceland) and Tromsö (Norway) in 1993. These connections used NORDunet (part of the Internet) as the connecting network.

In 1994 Helsinki University Central Hospital was the first to introduce a modern, broadband network (ATM= Asyncronous Transfer Mode) backbone into their digital in-house teleradiology network.

A questionnaire made in December 1994 revealed that teleradiology has been used in all five university hospitals, in 7 of 16 Finnish central hospitals, and in one district hospital. One private MRI clinic used a regular teleradiology link to send its images 400 km to a sub-specialist. Most transmitted images were emergency CT images, and between 0 to 5 cases per week were transferred. The exception was the private MRI clinic that transferred many MRI cases daily. Chest or bone images were transmitted daily in Turku. Neurosurgeons, neurologists, and surgeons were using clinical teleradiology links as often as radiologists. Scientific articles concentrating on the diagnostic performance of teleradiology have been written from Tampere, Turku and Oulu.

In the next five years all but two of the 16 Finnish central hospitals planned to have teleradiology in daily practice. Most often they wished to have a link to the university hospital for sub-specialist consultation or emergency care. Links to the primary healthcare (health centers) were delayed because of high investment costs. Therefore, low-cost but high quality solutions were needed.

In 1995 Turku University hospital started a PACS (Picture Archiving and Communication System) pilot in a digitized x-ray department equipped with an ATM network. The teleradiology connection to local hospital was made with an ATM. A connection was opened to Pori central hospital using ISDN.

Oulu University Central Hospital further developed their low cost solution for health centers and started a clinical service using an ISDN connection from Kuusamo primary healthcare center (PHCC) near the Russian boarder.

In addition, Tampere University Hospital began providing primary care with teleradiology. In 1995 the university hospitals in Oulu and Helsinki established an inter-hospital ATM-connection, which at the pilot phase was used for sub-specialist

consultations, 3-D modeling work, and making plastic fast prototypes for operation planning from CT scans of living persons.

**Internet**

Internet and Web based technology is heavily developed for telemedicine. During 1993-95 the Oulu University used the Internet in a trial for international patient consultations. Today, secure internet technology is under development for direct patient information exchange (EPR, telemedicine, and professional counseling).

The traditional way of using the Internet as an information source is well established. Finland has the highest proportion of internet connections in the world, and this is seen also in the healthcare sector. The hospitals and many primary healthcare centers have Internet access for professionals, and many also provide information services for their customers (see: **http://www ppshp.fi**, **http://www.odl.fi**, and **http://www.kuh.fi**). Also, the authorities can be reached by e-mail.

Since 1989 the Finnish Medical Association has had a regular nation-wide information network service for its members (see: **http://www.fimnet.fi**). The main components have been e-mail service, discussion forums, medical databases, and libraries. After converting the service to the Internet in 1995, the number of users has risen dramatically. Today, every member of the Association will have a username to the service. Also, important medical journals in Finland are available through the net.

There are already services that are intended for the public. Some private hospitals, doctors' offices, and dentists offer time scheduling via the Internet. There are also counseling services where you can ask about your personal health problems (see: **http://www.tohtori.fi**).

**Intranet**

Internet tools are used inside hospital networks because of common user interface. For example, Oulu University Hospitals is developing web-based multimedia EPR, which is already in the pilot phase. The present ESKO project combines existing operative systems and archives to a HTML (HyperText Markup Language) search engine which transforms patient information into HTML documents on the fly and makes them visible with a standard browser. In autumn 1998 all text input will be made in digital form. The user interface is already functioning in some wards and gives even wireless access via GSM to some test users. Connections through the firewall will enable telemedicine applications to be integrated into the service (see: **http://www.ppshp.fi/esko/demo/esko_en.htm**).

More conventionally, many hospitals use intranet technology as their electronic bulletin board and message service.

## Extranet

A secure environment is essential for delivering patient information to the point of care. This can be done in an Internet environment via virtual private networks (VPN). MediCiTool is a product that supplies hospitals and primary healthcare centers with secure e-mail, secure discussion groups, referral exchange, and information services. This secure extranet environment is currently being tested in Northern Finland between five hospitals and several primary healthcare centers. The system implements data encryption and digital signature. The same type of trials are emerging in other areas.

## International Activities in Telemedicine

Between 1993-1995, Oulu University Hospital cooperated with the University Hospitals in Reykjavik, Iceland, and Tromsö, Norway to test the Internet in telemedicine. This Nordic Teleradiology project lasted two years and was financed by the participating institutes.

One shot applications: there have been various pilot demonstrations organized by teleoperators, individual centers, and the Finnish Medical Association showing videoconferencing in the use of telemedicine.

According to the present knowledge there is no regular clinical services between Finland and foreign countries.

Today there is also participation in various European research projects.

In particular, the Satakunta central hospital and HC-ICE have been active in following foreign CME programs (from Mayo Clinics, etc).

*How is Telemedicine development related to other Healthcare telematics program?*

In Finland, telemedicine is a component of governmental “telematics in healthcare“ programs. Locally, the applications utilize available commercial networks. Both main operators supply each country with ATM networks between all major cities, providing full frame relay and ISDN connections (all telephone lines and switches are already digital), and mobile GSM data services. The prices are compatible due to years of free market. This makes specialized healthcare networks unnecessary. The universities have their own virtual research network (Internet II, with guaranteed bandwidth broadband ATM connections).

## *Telemedicine activities self-sustainability and economical issues*

Today, hospitals and primary healthcare centers pay for their own investments in technical solutions. Project funding helps start new activities, but regular service must be paid by the users. In practice, this means terminal equipment (e.g. videoconference

units) can be bought with subsidized resources, but telecommunications plus network infrastructure must be paid by the user. There is no special source of money for outside projects. In the present economical situation, every decision needs a good reason.

The question of payment of TM services or activities in Finland is still open. The public healthcare system carries the economical burden to establish services, but employers patients, and insurance companies receive the benefits.

Today, the local communities mainly carry the direct costs. The services (telediagnosis, second opinion) are charged according to a case by case agreed fee. There is no national recommendation. In most of the cases, the radiologists receive an extra fee for teleconsultations because of working overtime, but this a not a rule. For example, emergency services are given by junior doctors on duty at the hospital. One private hospital gives teleradiology services but this system is subsidized by one of the teleoperators. There are no private on-call centers. There has been public discussion that those who receive the real benefit should participate in fees, but no actions have been taken.

## C. Telemedicine in Greenland

*Provided by Thomas Stensgaard*

Telemedicine was introduced in Greenland in 1994. Flat-bed scanners were bought for some of the hospitals along the coast and, during the next two years, quite a few x-rays were sent to be assessed at the department of radiology (at the main hospital).

In the autumn of 1996 a project was launched, which included videoconsultations from one hospital outside the capital and one nurse station outside the capital to the main hospital and the Primary Healthcare Centre in the capital. Otoscopes and laryngoscopes were used as peripherals, and there were some transmissions of ultrasounds from the hospital outside the capital to the main hospital. Also, there were videoconsultations, including echocardiography, from the main hospital in Nuuk to Rigshospitalet, Copenhagen.

The project was evaluated at the end of 1997, but it was not possible to draw definite conclusions from this evaluation, apart from the fact that the technology worked nearly every time. For diagnosing, it was a great help in many situations to have pictures to look at.

An attempt was also made to evaluate the project financially. However, while it was comparatively easy to calculate the cost, it was much more difficult to estimate how much could actually be saved.

Videoconsultations continued between the nurse station and the Primary Health Care Clinic in Nuuk throughout 1998, and is still used as a routine service. The same

applies to the echocardiography transmissions between the main hospital in Nuuk and Rigshospitalet in Copenhagen. There was also some activity within teleradiology. No evaluation of these activities has taken place, but the users are pleased with the quality.

On this background, and because no other initiative was taken to create the financial background for the continued work with telemedicine, four enthusiasts made a business plan for telemedicine in Greenland for the years 1999-2001. These enthusiasts represent those who worked with the practical sides of telemedicine and the central administration during the new year 1998-99.

This busines plan describes in detail how telemedicine should be implemented in Greenland within the time mentioned, as well as which fields of medicine should be included. It also describes the demand for staff which will be needed and the technical equipment necessesary, including transmission. It also has a financial estimate and a suggestion for the budget. Finally, it describes which kind of evaluation should be incorporated into the project.

Implementation of telemedicine will take place first in Nanortalik, Qaqortoq, Paamiut, Maniitsoq, Kangaamiut, Ilulissat, and Ittoqqortoormiit. The specialized medicine involved will be radiology, dermatology, and ECG--all as store-and-forward. However, the dermatologist can have the option to require a videoconference if the information supplied by still-pictures is not sufficient. In addition, psychiatry and non-specified videoconsultations between a nurse in a settlement and a doctor in a town are cases in point.

At each center, 2-4 persons will be appointed by the local administration to carry out practical jobs such as taking pictures, transmitting pictures, and making sure doctors receive information about results. Furthermore, they will be responsible for reports of any technical problems, and they have to collect evaluation material. Thanks to funds allocated, they will receive a fee for collecting the evaluation material. The plan of operation also describes which equipment should be used, but the final selection of equipment happened later. A dedicated net with a bandwidth between 64 Kbit and 2 Mbit was chosen for transmission, and all programs are free web-programs which we have developed for our use. The plan of operation also comprises a financial estimate and a suggestion for the budget. This includes a survey of staff in the central unit of telemedicine. The budget for 2000 is DKK 3.8 mill., which is approximately $550,000 US.

In order to ensure a sufficient number of examinations to constitute a satisfactory evaluation material, and to make sure that telemedicine is incorporated as a daily routine, it has been arranged with each center that a minimum of transmissions within the relevant specialized medicine - psychiatry excepted, however - are sent on a weekly basis.

The evaluation includes the following fields: satisfaction among patients, satisfaction among users, logistics, organisation, technique, medical outcome, waiting time, travel, and economy. Evaluation appears as a health technology assessment and was made in cooperation with the National Center for Telemedicine in Tromsø. We have received substantial funds for this and, apart from developing a smooth telemedicine program, we expect to be able to evaluate this in a way which will form a qualified basis for future decisions on telemedicine.

The business plan was approved in the spring of 1999--with some reservations for the years 2001 and 2002, because it was decided to await a preliminary evaluation which must be completed by the spring of 2000--before money for the two subesquent years will be allocated.

Implementation of the plan is currently taking place at full speed, which means of course that we are a couple of months behind schedule.

As of March 2000, all equipment was installed at the outposts, staff were trained, and a number of trial transmissions took place. Many of these, however, included genuine clinical problems. Evaluation material has been produced and the first centers were launched in April 2000 with full production and use of the evaluation material. All centers are opperational as of the summer of 2000.

## D. Telemedicine in Norway

*Provided by Tove Sorensen*

Telemedicine[1] is not a new medical discipline, but a set of communication services that enable medical resources to be utilized in a new and better way. To date, telemedicine in Norway, particularly in Tromsø, has largely comprised telemedicine in the sense of remote consultations and remote diagnoses using sound/picture communications, with the patient and doctor being present at the same time. In this type of communication, a doctor or other health worker is usually present with the patient in a doctor's office or at a local/central hospital. From here they communicate with a specialist who gives a diagnosis or provides guidance on further treatment of the patient. Regular services are in operation in the fields of dermatology, ear, nose and throat, cardiology, pathology, and psychiatry. As a method, telemedicine compensates for distance.

At present, a number of trials are being conducted in which patient information is transferred electronically as a basis for diagnosis and treatment. The information is sent to the recipient doctor/technical personnel in the form of a message with attachments consisting of text, images, video, etc. These electronic documents are

[1] Telemedicine can be defined as follows:
Rapid access to shared and remote medical expertise by means of telecommunications and information technologies, no matter where the patient or relevant information is located.
This definition is taken from the EU Commission's program *Advanced Informatics in Medicine.*

then processed and answered within an agreed period of time. Consultations, at which the doctor(s) and patient do not need to be present at the same time, are easier to arrange and coordinate. Furthermore, the equipment and transmission capacity requirements are more modest because the time factor is, in theory, of secondary or minor importance.

Two reports provide the basis for a strategic plan of action (1996)[2]. Five goals were formulated:

1. Increase the competence of health personnel -- better diagnoses and treatment
2. Simplify the procedures for updating and storing information -- more time for the patient
3. Improve communications between various stages -- better coordination
4. Encourage the provision of more information to patients -- more power to the patient
5. Ensure full security of information -- ensure proper and efficient treatment of patients and full data protection

A halfway summary prepared by the Ministry in May 1998 confirms that the visions and overriding objectives of the plan are realistic. A number of measures have been completed and implemented within the framework of the plan and overall are expected to make a significant contribution to the fulfillment of the plan of action.

The point of departure of the recommendation of the working party[3] is that telemedicine should be developed within the framework of what is technologically possible, desirable from a medical perspective, organizationally suitable, and economically profitable. In order to steer the development of telemedicine and its consequences in the desired direction, public policy must be defined within these terms. For the tools of the public authorities to have the intended effect, it will be necessary to conduct an ongoing debate and continuous research into the effects of telemedical measures.

At present there is some level of telemedical activity in all Norwegian healthcare regions. The working party has concluded that the Telemedical Department in Tromsø should continue to function as Norway's leading tele-medical community and competence center. Research and development should be conducted in line with the recommendations and advice given by the Tele-medical Department.

Methods such as teleradiology, teledermatology, telecardiology, telepsychiatry, and distance education are now well developed and allow resources to be saved. These

[2] The Norwegian Ministry of Health and Social Services have written a plan of action for health telematics / telemedicine 1997-2000: ”More Health for Each bIT – Information Technology for better Health Services in Norway.” In Norwegian at **http://odin.dep.no/shd/publ/itplan/** A summary in English is available upon request.
[3] As described in **http://odin.dep.no/shd/publ/1999/telerapport/tele.html**

measures should therefore become part of regular operation and should be funded in the normal way by means of rates, framework subsidies and county funding.

Further research should be conducted within all fields of telemedicine. The regional level is considered to be a suitable level for operating and testing telemedical solutions. Telemedicine should therefore be defined explicitly in the regional health plans. The region is an ideal level for both establishing an identity and for constructive cooperation.

Northern Health Care Region should function as a shop window for the operation of telemedical solutions within a broad perspective that takes account of people, organizational structure, and technology. A comprehensive approach of this kind involving the tight integration of technology, interfaces, organizations, and users will be conditional upon the existence of a highly developed and active user environment within the region.

A wide range of intellectual communities are involved to a greater or lesser extent in the development of IT-based solutions and services for the health sector:

1. The Norwegian Centre for Medical Informatics (KITH) (see: **http://www.kith.no/**) has as its main objective to ensure the implementation and use of information and communication technology that enables the healthcare services to fulfil their common needs and objectives for efficient and secure information management, collaboration, and development.
2. The National Centre on Emergency Communication in Health (KoKom) (see: **http://www.hibinc.no/kokom/English.htm**) is a national center established in 1997 in Bergen. KoKom's objective is to act as advisor to government, both centrally and locally (counties and municipalities), on the running of dispatch centers in the healthcare services. The center is also a member of the national project committee concerning possible Norwegian acceptance of TETRA as the national standard for radio communication in emergency services.
3. The National Centre of Telemedicine (NCT) (see: **http://www.telemed.rito.no**), University Hospital of Tromsø (UHT) is a research and development center engaged in development, testing, and evaluation of modern information and communications technology within the health service. As a national center, NCT also functions as an advisory body to the national authorities. NCT has an international profile. At present, the World Health Organization (WHO) is assessing NCT for making it a global cooperation center for telemedicine. NCT's vision is to make healthcare services available for everyone everywhere by means of telemedicine. The overall objectives are:

    - To provide patients with better healthcare with the aid of telemedicine.
    - To create and disseminate knowledge about telemedicine.
    - To ensure that all telemedical solutions are of a high quality.

To further these objectives, NCT produces telemedical solutions and evaluates them from the perspective of diagnostic quality as well as legal, organizational, and economic preconditions and consequences.

## E. Telemedicine Collaboration between Norway and Northwest Russia

*Provided by Tove Sorensen*

For several years the National Centre of Telemedicine (NCT), University Hospital of Tromsø (UHT), has been engaged in various healthcare projects with Northwest Russia (see: **http://www.telemed.rito.no**).

The Arkhangelsk region is situated in Northwest Russia, to the south and east of the White and Barents Seas. The region covers an area of 580.000 sq. kilometers, which means that Arkhangelsk is larger than any country in Western Europe. Its population of 1.5 million is mainly concentrated in the central cities of Arkhangelsk, Severodvinsk, and Novodvinsk, but several communities are located in remote parts of the region. Many of these communities do not have any road or railway connection to the outside world. Air transport is used all year, while sea and river transport is only possible in summer and autumn. Telecommunication infrastructure is poorly developed. Links to Moscow, St. Petersburg, and Norway have been improved lately, but within the region mainly old telephone lines are available.

As the county of Arkhangelsk experiences some of the similar problems as in northern Norway--with scattered populations and long distances between hospitals and healthcare centers, which again means expensive transport of patients--the Russian authorities have become very interested in implementing telemedicine services in the Arkhangelsk region.

### Teleconsultations in Arkhangelsk Region

During the last several years, telemedicine activities--based on feasible and economical technology--have increased significantly in the county of Arkhangelsk. Small telemedicine units have been established at seven local hospitals and are in regular use. Specialists at the Regional Hospital of Arkhangelsk are diagnosing patients from remote hospitals. The technology is PC-based and uses a system (VIDA [1]) to capture, add text to, and send still images from one site to another using modem links. Interactive audio is accomplished using loud speaking telephones.

Teleconsultations are being used for a variety of medical purposes. In the period 1996-99, 205 teleconsultations were conducted for a total of 158 patients. The number of specialists attending each consultation at the Regional Hospital of Arkhangelsk varied from one to nine. The condition was critical for the majority of the patients. Without teleconsultations, the patients would have been transported by air to the city of Arkhangelsk or a medical team would have been sent to the local hospital.

## Distance Teaching Tromsø-Arkhangelsk

Still images and loudspeaking telephone is also used for distance teaching between the regional hospitals of Tromsø and Arkhangelsk. The majority of the lectures have been prepared as well as aimed at *nurses*, but other healthcare professionals are present. Due to the limitations of the telemedicine studio of Arkhangelsk and the size of the monitor, an audience of 30 people is the maximum. A typical lecture lasts for approximately 60-90 minutes, as there is always a great interest in discussing the topic afterwards. The hospitals take turns in giving lectures; from 1996-99, 38 and 12 lectures were given from Tromsø and Arkhangelsk respectively. One example of distance teaching is the lectures given on diphtheria by professors at the Pathology Department at RiA. Since there are very few cases to be found in Norway today, the Russian experiences on detecting and treating diphtheria is very useful information. Since April 1999 a videoconferencing link (128 kb/s) has been established between Tromsø and Arkhangelsk[4].

## Mobile Telemedicine Unit

In the Arkhangelsk region, emergency care is organized from the Regional Hospital of Arkhangelsk (RiA) where the medical specialist team travels to the patients by ambulance or helicopter. Due to long distances, there is a need for good communication means for assisting the team when operating outside the main hospital. For these situations, NCT--in cooperation with the Emergency Ward at RiA--is developing a mobile telemedicine unit to be tested and evaluated in the Arkhangelsk region in 1999-2000.

## Evaluation

Two Norwegian-Russian teams of economists and sociologists have evaluated Telemedicine activities in the Arkhangelsk region. The aim was to produce scientific knowledge on the effects of telemedicine compared to traditional medical services. The reports are available at: **http://www.telemed.rito.no**

## Funding

The project has received considerable financial support from the Norwegian Ministry of Foreign Affairs, the Barents Euro-Arctic Region, and the Inter-Reg Barents Programme. The telemedicine center in the Regional Hospital of Arkhangelsk and telemedicine studios at six local hospitals in the region were financed partly by the Norwegian Centre of Telemedicine and partly by the Regional Health Administration of Arkhangelsk. In the early phase of the project, Telenor Research and Development contributed technical support to the project.

4 The videoconferencing link can be used by people and institutions outside NCT and RiA. Please contact Mr. Hans Elvheim, NCT, P.O. Box 35, N-9038 Tromsø, Norway, Tel. (+47) 77 62 81 32 / e-mail: tmahae@rito.no

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VIDA[1] - Still-image system can be found at: **http://www.fou.telenor.no/**

Review article Telemedicine in north-west Russia (T Sorensen, A Rundhovde, VD Kozlov, 1999) can be ordered from T. Sorensen
Email: tmatos@rito.no

## F. Telemedicine in Sweden

### The Telemedicine Forum

*Provided by Ingegard Malmros*

This is a project for establishing a secure virtual meeting and working place, and providing effective means of collaboration between and within nations.

### Coordinators

Lt. Col. Eugén Charysczak, Technical Manager, Gotland Military Command, Member of the Board, AFCEA Visby Telemedicine Chapter, Sweden

Lt. Col. Ingegärd E. Malmros, Senior Medical Advisor, Gotland Military Command, Member of the Board, Secretary, AFCEA Visby Telemedicine Chapter, Sweden

**Background: The Heritage of the Telemedicine Conference**

In the summer of 1998, an international telemedicine conference was held in Visby. It was titled "Telemedicine - International Medical Care Networks" and was organized by Gotland Military Command, Gotland County Administration, the Municipality of Gotland, TMC (TeleMedical Development Centre Huddinge-Visby), and the US Embassy to Sweden. About 200 delegates, representing the countries of Russia, Ukraine, Estonia, Latvia, Lithuania, USA, Sweden, and other Scandinavian countries, convened to discuss the possibility of collaboration, to share their experiences in utilizing modern information technology within healthcare, and to build a contact network.

The conference focused on:

- The benefit of common development, education, and training in the telemedical fields by enhanced co-operation by civilian and military authorities in the Baltic Sea Region.
- The possibilities of more effective use of medical resources within the Baltic Sea Region.
- Trends in telemedical technical developments.

For more information please see: **http://www.yoldia.com/telemed/frameset.htm**

As part of the concluding remarks of the conference, the delegates proclaimed a number of issues to be especially important for the development of telemedicine and collaboration within the Baltic Sea Region. The delegates emphasized that, above all, what is needed is the establishment of a network of individuals, institutions, and authorities who share an interest in collaborating for the betterment of telemedicine. Also concluded was that a virtual meeting and working place should be created to provide a cost-effective means for such collaboration.

A volunteer organization--the AFCEA Visby Telemedicine Chapter, a subchapter to AFCEA Stockholm Chapter--was established to support the telemedicine network in different ways. The history of the AFCEA Visby Telemedicine Chapter owes its origin to two conferences held in Visby in 1998. The first was on the subject of "Information Technologies and Co-operation in the Baltic Sea Region," which the AFCEA Stockholm Chapter organized. Shortly thereafter came the international telemedical conference mentioned above, coinciding with the US Naval medical ship *Comfort* (see: **http://www.yoldia.com/thevisit/index.htm**).

A follow up international telemedicine conference within the network was held in Visby in September 1999 (see: **http://www.yoldia.com/konf9909/index.htm**).

AFCEA Visby Telemedicine Chapter was formed specifically to:

- Promote the telemedical co-operation in the Baltic Sea Region.
- Contribute to the creation of a network in the area of telemedicine.

- Stimulate research and development in the area of telecommunication, in particular telemedicine.

The project idea of a *Telemedicine Forum* offers a possible solution to the collaborating needs of the developing telemedicine network. Because this forum is both internet-based and built upon X.500 directory standards, it will be secure, easily accessible, and capable of supporting many different types of telemedicine projects. State-of-the-art web and multimedia services, together with careful administration of a secretariat, means that the forum will be both well structured and modern. Gotland University College, accepted as a relatively neutral organization, has been deemed a natural choice for the network's secretariat.

**Purpose of the Project**

The goals of Telemedicine Forum are to:

- Provide a *secure* virtual meeting and working place on the Internet. Both the security and search functionality of the forum is based upon the international accepted X500 and X.509 directory standards.
- Support and develop the telemedicine network established at the telemedicine conference in Visby in 1998.
- Facilitate multidisciplinary, multinational co-operation as a tool for assisting democracy and confidence building processes.

**Description of the Project**

Gotland University College volunteered to establish a Secretariat responsible for managing the vitality of Telemedicine Forum, where the network can develop through virtual meetings. The secretariat itself will not be responsible for medical competence, but rather for the administration of the web. Most importantly, the Telemedicine Forum will exist as an "open" workplace, and not strive to compete with other partners, but serve as a professional resource. The Telemedicine Forum is meant to be a neutral platform, allowing for both non-commercial and commercial collaboration, as well as providing services for everyone from individuals to companies, institutions, and authorities. The Telemedicine Forum will provide the possibility to work with projects, perform research, offer distance education, connect through videoconferencing, meet in discussion places, link to digital-medical libraries, find new collaboration partners, visit exhibition halls, and search an electronic catalogue of network members.

The Forum will be logically divided into two parts: one "public" area, containing information available to everyone, and one secure area for collaboration that can involve the exchange of private and/or confidential information. The security features of the Telemedicine Forum are based upon X.500 and X.509 standards that allow for the same security level used within bank commerce.

Aside from the administration of the web site, the Secretariat could also coordinate conferences/meetings for collaboration partners, guest lectures, etc., and make visits to other countries within the initial network. With its Hanseatic city of Visby, and its strategic location in the middle of the Baltic Sea, Gotland has a rich heritage of being a place of gathering and trade, and offers even now an excellent environment for meeting and collaborating, both virtually and in real-life.

**Possible Activities and Development by the Complementary Nodes in the Baltic Sea Area**

The Telemedicine Forum's Secretariat will operate from a central node in Gotland, with all other nodes in the Baltic Sea Area connected to this. Because of Gotland's high-speed connection with Stockholm, all of the international-telematic services can simultaneously be offered to all other nodes. Each node's security services will be based upon the same X.500/X.509 standard, providing for a uniform security across the network.

A uniform quality of telematic services and high security across all nodes within the network is what will set the Telemedicine Forum apart from other platforms of its kind. New standards of healthcare are possible, along with a rich collaboration between universities, authorities, individuals, and companies.

**Examples of Potential Activities of the Telemedicine Forum**

- Platform for secure-electronic commerce
- Platform for secure-electronic messaging, including email
- Platform for distributing information services (between and amongst private persons, companies, authorities, and organizations)
- Platform for telemedicine consultations (including implementation of telemedicine in primary healthcare)
- Platform for distance education
- Platform for establishing centers of competence and development in IT industry
- Secure platform for distribution of software and electronic information (including multimedia infotainment)
- Bridges for the introduction of a new industry within a region

**Conclusion**

Since the telemedicine conferences in Visby 1998-99, we have been working hard to establish the Telemedicine Forum, the internet gathering place for our continuous meetings. It has been difficult to get the resources required for this, but ComPodium Ltd is providing services that will be included in the gathering place. The concept of the Telemedicine Forum is scheduled to be implemented with its administrative Secretariat at Gotland University College, and can thereafter be a useful tool for supporting the telemedicine network worldwide.

On the 1st of October 2000, Eugen Charysczak and I will begin working full time to establish the internet gathering place called telMEDit, the "clearing house" for medical information. The prototype is under construction and we will be selling stands for the Swedish conference, taking place in June 2001, at the 5th International Society for Telemedicine exhibition in Montreal in October 2000 (see: **http://www.isft2000.com**).

The Telemedicine Forum will provide a lot of services at a high professional level. The internet site will contain possibilities for conferencing, workshops, seminars, and education. The Telemedicine Forum contains the telemedicine agora where everybody can meet, chat, mail, find each other by searching in a catalogue, creating specialty groups etc.

ComPodium Ltd and the Swedish Armed Forces are making the acute trauma care telemedicine application, using different telecom.technics with ISDN, satellite, etc. On the morning of August 23, 2000, this application was broadcasted live on line (see: **http://www.compodium.se/tjanster/webcast/vrumwebtv.htm**).

## G. Telemedicine in the USA

*Provided by Dena Puskin*

Telemedicine, in one form or another, has been practiced for over 30 years in the United States. Telemedicine in the United States is often referred to as the provision of clinical services at distance. These services range from classic consultations between physicians regarding the care of a patient, providing speech therapy or other rehabilitative therapies at a distance, and monitoring patients at home. We often refer to the broader use of telecommunications and computer technologies for the provision of educational, clinical, and administrative services as “telehealth.” The following discussion is primarily limited to telemedicine activities, but it should be understood that distance learning and administrative applications are an integral part of most successful telemedicine programs.

According to the 1999 Annual Report on US Telemedicine Activity by the Association of Telehealth Service Providers, more than 52,000 teleconsultations were performed in 1998, up from 41,740 in 1997.

Most of the growth has been fueled by federal and state programs to improve access to healthcare for underserved rural and prison populations. The US Federal government has been funding telemedicine programs in rural communities since the 1960s, beginning with projects in Alaska and on the Papago Indian Reservation. Although difficult to assess, the current estimate of federal non-military funds available in FY 2000 for telehealth projects in rural communities is over $240 million. Some of the funds are through targeted telemedicine programs, while others are buried in investments made by government and private sector healthcare providers. Currently, the Alaska Federal Health Care Access Network (AFHCAN) project is the largest federally funded project in the US arctic region, with funding from the military and the

Office for the Advancement of Telehealth to support the building of the physical and telecommunications infrastructure for telemedicine in Alaska. Smaller projects such as the Eastern Aleutian Tribe Telehealth Project focus on the needs of individual communities beyond the need for physical infrastructure.

Throughout the United States, the wider adoption of telemedicine has been hampered by a number of factors. One of the biggest roadblocks is a lack of systematic reimbursement for telemedicine. Other hurdles include the high cost of implementing telemedicine networks, especially the continued high cost of transmission services in many rural communities; the lack of awareness about telemedicine among healthcare practitioners and their patients; concerns about whether it is cost effective; and the difficulty of using technology.

To help overcome these roadblocks, representatives of the various agencies involved in telemedicine within the US federal government formed the Joint Working Group on Telemedicine in 1995 (see: **http://telehealth.hrsa.gov/jwgt/jwgt.htm**). In 1997, the group reported to Congress on the many barriers to telemedicine, and while progress has been made since that time, the progress has not been enough. Currently, the group has been involved in developing technical guidelines for telemedicine. It is very interested in pursuing international collaborative evaluation activities that will help address the issues of cost-effectiveness and provide models for overcoming the barriers to greater deployment of telemedicine.

**Alaska Telemedicine Project, 1994-Present**

*Provided by Frederick W. Pearce and Kathe Boucha*

The Alaska Telemedicine Project was founded in 1994 by the Applied Science Laboratory of the University of Alaska Anchorage (UAA), Providence Health Systems in Alaska (PHSA) and Alascom (now AT&T). The stated goals of founding members of the Alaska Telemedicine Project (ATP) were “to discover if telemedicine and telehealth applications and technologies could improve the delivery of healthcare in frontier Alaska.” The Alaska Telemedicine Project has been recognized by the Legislature of the State of Alaska and by the Alaska Rural Development Council in resolutions of support.

Project members developed research models that recognized Alaska’s demographics, economics, history, and unique telecommunication environment, and based their investigations on early Alaska telemedicine “experiments” that used single-side band radio, satellite radio and television, and the NASA-sponsored ATS 1 and ATS 6 projects in 1967 and 1973. Project members sponsored seven “knowledge sharing” symposia in Alaska using acknowledged experts like Soren Pedersen, M.D., Jay Sanders, M.D., Doug Perednia, M.D., Paul Zimnik, D.O., John Evans, MSEE, and Dena Puskin, D.S. These symposia were designed to develop partnerships with projects that were using advanced telecommunications and information technologies.

Early investigations lead project members to a number of working conclusions: 1) Alaska's telecommunications environment necessitated a "narrow bandwidth" approach; 2) Alaska's healthcare professionals were less interested in videoconferencing than in medical telemetry and high resolution imaging; 3) in order to be "sustainable," telemedicine applications and technologies needed to be predicated on the "public switched network" and scaled to small and dispersed populations, and 4) in order to be effective, telemedicine and telehealth applications had to be based on a "business plan" that ensured that a telemedicine encounter was clinically "as good or better than" and "cheaper than" the current model of transporting people to healthcare.

In order to ensure that any "effect" of telemedicine demonstration projects could be understood, project members developed needs assessment instruments and an evaluation matrix designed to be used throughout the state and with any telemedicine and telehealth application or technology. The needs assessment instruments were designed to measure the "readiness" of frontier and urban healthcare systems for telemedicine. The evaluation matrix was designed to measure patient and provider satisfaction with telemedicine and telehealth applications; the cost and benefit of telemedicine encounter; and the utility of telemedicine and telehealth encounters.

In 1994, founding project members began to develop and deploy a healthcare communication system in response to partner requests for a secure communications system capable of medical messaging and internet email. The Alaska Telehealth System (see: **www.telemedicine.alaska.edu**) was developed and deployed to allow members to communicate with each other and to begin clinical decision support activities. This web site is built upon a secure messaging system that is a "virtual private network" that uses the existing "public switched network." The Alaska Telehealth System was designed to work from 2.4 kbps to "fast ethernet." Since 1994, it has been expanded and used by up to 1,600 healthcare professionals in Alaska for secure messaging, digital image and data transfer, email, and healthcare informatics. From 1995 to 2000, the Graduate Nurse Practitioner Program at the University of Alaska Anchorage used the Alaska Telehealth System to deliver "on-line" graduate instruction, helping train Alaska's pioneer "telehealth Nurse Practitioners."

In 1995, the Alaska Telemedicine Project's founding partner Providence Health Systems in Alaska deployed a teleradiology system based on the use of "narrow bandwidth" and dedicated 56 kbps circuits from Anchorage to sites in frontier Alaska. Teleradiology systems were compared and evaluated. This teleradiology project has placed image acquisition systems in seven remote sites and reading systems in the homes of eight physicians in Anchorage, and has had over 22,000 encounters on a 24 hour a day, 7 days a week basis. Other Alaska Telemedicine Project partner activities include the demonstration of medical imaging from Nome to Stebbins using the "Picasso Picturephone," the evaluation of the 3rd Medical Group at Elmendorf Air Force Base teleconferencing system, and support for demonstration projects in Barrow, Ft Yukon, and Juneau.

In 1996, on behalf of project members, UAA was awarded a National Library of Medicine contract (Contract #NO1-LM-6-3540) for an "evaluation project" to demonstrate "narrow bandwidth telemedicine and telehealth applications and technologies in frontier Alaska." This three-year "Alaska Telemedicine Testbed Project" (ATTP) contract was designed to develop and deploy 31 telemedicine workstations to be used in health clinics in Native villages in western Alaska. The purpose of this project was to evaluate the use of telemedicine for ear, nose, and throat (ENT) and dermatology. The working hypothesis for this project was that telemedicine could re-engineer healthcare delivery in frontier Alaska by delivering clinical decision support for ENT and dermatology to community health aids "when it was needed." The project was predicated on the assumption that "transportation dollars could be re-engineered into healthcare dollars" by moving "healthcare services to people" instead of moving "people to services." ENT was chosen because of the severity of otitis media in frontier Alaska. The "Alaska Telemedicine Workstation" and "ATTP" system were designed as a platform that could be expanded to include additional features (like videophone where bandwidth was available and affordable) and additional clinical applications.

Between 1998–99, after collecting pre-intervention baseline data questionnaires, project equipment was sent to 26 native villages, four regional hospitals in Bethel, Dillingham, Kotzebue, and Nome, as well as the Alaska Native Medical Center. Training and support mechanisms were developed to ensure that community health aids were able to use this "tool" to improve the delivery of healthcare to their villages. Over 6,000 clinical uses and 1,500 clinical encounters for ENT have been recorded. Data are currently being analyzed. Preliminary data were presented at the American Public Health Association annual meeting in 1999, and at the 2000 meeting of the International Congress of Circumpolar Health. Manuscripts are currently being prepared for publication. Additional information can be found at http://137.229.128.211/nlm/index.html.

The Alaska Telemedicine Project has proven that "narrow bandwidth" telemedicine and telehealth applications and technologies can be both clinically and cost effective in improving the delivery of healthcare in frontier Alaska. Project members believe that the project is a viable model for arctic countries and for developing nations. Since 1994, project members have consulted with partners in Canada, the Russian Far East, Siberia, Romania, Bulgaria, Hungary, Zimbabwe, and Australia.

**The Alaska Federal Health Care Access Network (AFHCAN)**

*Provided by Stewart Ferguson and Asta Keller*

The Alaska federal healthcare system consists of 208 facilities located in 194 communities. The Alaska Federal health-care. The Alaska Federal Health Care Partnership (AFHCP) was created to provide readily available access to cost-effective healthcare services to federal beneficiaries located throughout the vast state of

Alaska. Beneficiaries comprise 40% of the state's population and are located throughout Alaska.

AFHCP created the Alaska Federal Health Care Access Network (AFHCAN) project in order to improve access to healthcare for federal beneficiaries through the use of sustainable telehealth systems. The AFHCAN project supports 37 member organizations, representing over 235 sites across Alaska for the benefit of over 200,000 federal beneficiaries. These member organizations include:

- ANTHC/Tribal Entities/IHS: 32 member organizations, 195 sites, 97,000 beneficiaries
- Veteran's Administration(VA): 1 member organization, 1 site, 65,000 beneficiaries
- Department of Defense (DOD): 2 member organizations, 9 sites, 47,000 beneficiaries
- United States Coast Guard: 1 member organization, 4 sites, 3,000 beneficiaries
- Alaska Department of Public Health and Social Services, Division of Public Health, Public Health Nursing Program: 1 member organization, 26 sites

**Alaska Federal Health Access Network Project**

AFHCAN is designed as a four year (1999 – 2002) project. The first year, FY99, focused on project development. The current year, FY2000, the focus is on deployment of Phase I equipment to 235 sites beginning with the summer of 2000. Phase I deployment will offer a clinical workstation (computer, video otoscope, digital camera, and digital ECG). The third year will focus on Phase II deployment. Phase II will offer health education kiosks and additional telemedicine applications such as videoconferencing. During the final and fourth year of the project, FY2002, the focus will be on continuing implementation and support of telehealth systems. Evaluation will be on-going throughout the life of the AFHCAN project.

Sustainability planning is a collaborative initiative between all partners and member organizations. The AFHCAN Project Office has implemented an assessment planning process. A major component of this planning process requests that all member organizations determine a long term plan to continue the telehealth system following the project time period. Their individual long-term plans will establish their telehealth priorities and incorporate statewide telehealth core.

The AFHCAN network is successfully co-located at two telecommunication companies, GCI and AT&T. Sites linked to the network by early summer 2000 are Maniilaq Native Association, the Veterans Administration, Alaska Native Medical Center, and the Anchorage Project Office. Eastern Aleutian Tribes and Bristol Bay Health Corporation will be linked by the end of summer 2000 with other participating sites following.

## Related Projects Conducted by the Relevant Partners

According to the ATAC final report of June 30, 1999, the state of Alaska is reaching a critical mass of experience and knowledge resulting from a number of projects dealing with telemedicine over the last 25 years. This list of recent projects includes: the joint University of Alaska/Anchorage NLM Telemedicine Project; the Alaska Telemedicine Project; Bartlett Telemedicine Project; WWAMI Telemedicine Project; The Auroranet Project; and the NTIA Telemedicine projects via the Yukon-Kuskokwim Health Corporation, North Slope Borough, and the Congress of Athabascan Tribal Governments.

## Statewide Planning Committees

To facilitate all goals of the project, AFHCAN recognized the importance of statewide input throughout the duration of the project. Statewide committees, with invited participation of members from all 37-member organizations in the AFHCAN project, are involved in the decision-making process. The statewide committees are organized around the following areas: Clinical, Training, Technology, Informatics, and Business. Each one of these Committees is coordinated and facilitated by personnel staffing the AFHCAN Project Office staff and chaired by one of the member organizations. Each of the planning committees reports back to the AFHCAN Steering Board on a regular basis. Between November 1999 and June 2000, each committee met between four and eight times. The overall objective for each committee is as follows:

- Clinical Committee Overall Objective: To identify necessary solutions, develop clinical protocols and procedures, and to prioritize telemedical applications for deployment.
- Training Committee Overall Objective: To devise strategies for training.
- Technology Committee Overall Objective: To develop a plan to implement and maintain equipment and systems.
- Informatics Committee Overall Objective: To develop a plan for access to information and integration of systems.
- Business Committee Overall Objective: To provide guidance in the evaluation of financial viability and long term sustainability of telehealth systems.

## Sustainability Planning

In the development process towards self-sufficiency, the Alaska Telehealth Advisory Council (ATAC) in the Final Report (June 1999) recommended planning that all telehealth in Alaska be based on the following priorities and telehealth core principles:

- Any entity that becomes engaged in statewide telehealth in Alaska should ensure equal access, when financially realistic, to all Alaskans who would benefit from this technology.
- All entities participating in telehealth must assure that their systems meet inter-connectivity and inter-operative standards and participate in the coordination of other telehealth efforts in the State of Alaska.

- All telehealth applications should be acceptable to both the patient and the provider and be easy to use.
- All entities that participate in telehealth must determine their financial viability for the long term, including the provision of professional capacity development and training as an ongoing component of operating expenses.
- All participants in telehealth in Alaska should engage in a needs assessment and evaluation of services.

The AFHCAN project incorporates these ATAC core principles in its Master Operating Plan (MOP) and as well as in this proposal's work plan. Based on the MOP guidelines, and thus the ATAC core principles, the AFHCAN Project Office developed an assessment planning process in which all member entities must determine their sustainability plan for the long term.

**The Alaska Telehealth Advisory Council**

In an effort to assure a coordinated approach to telemedicine within the US Arctic and all of Alaska, the Alaska Telehealth Advisory Commission was created and charged to bring together the various groups working on telehealth in Alaska. After its first year and the preparation of their "Final Report," it reorganized as the Alaska Telehealth Advisory Council to extend its working life. It is currently supported with funds derived from the AFHCAN Project described above. It continues to work on its initial charge to assure efficient and interoperability of the telemedicine systems in place in Alaska.

***Original Draft Charge for Alaska Telehealth Advisory Commission, January 1999***

1. Propose a framework for rational development and deployment of statewide capacity for telehealth/telemedicine systems.

2. Establish core principles to ensure a coordinated, cost-effective, and integrated approach to telemedicine in Alaska.

3. Consider ways to assess effectiveness, efficiency, and whether or not telemedicine is improving equity of access to healthcare services for all Alaskans.

4. Recommend process for addressing issues as they emerge with changing technologies and practice patterns.

***Selected Issues for Consideration by the Alaska Telehealth Advisory Commission***

1. Clarify Goals, Objectives, and Accountability Structures of Interested Parties/Stakeholders

    - AFHCAN Project (Alaska Federal Health Care Access Network)
    - Private hospitals and other healthcare providers

- University
- Medical, Public Health, and Mental Health Communities
- State service providers and policy making agencies (DHSS, AK Dept. of Corrections)
- Other social services providers
- Telecommunications service providers

2. Develop Core Principles for Development of Telehealth in Alaska

- Efficiency and cost effectiveness
- Responsible use of funds and resources
- Equal access to healthcare services
- Adequacy and access to the infrastructure
- Open architecture of systems

3. Outline Competitive Forces and Common Goals

- Competition for resources
- Competition for patients, clients, market share
- Developing rational referral systems
- Security and confidentiality
- Competition in Telecommunications (and alternative technologies)
- Linkages, compatibility, and barriers among the telecommunications providers
- Differing expertise, technologies, interface issues
- Infrastructure gaps

4. Identify State Policy Issues in Telemedicine and Telehealth

- Liability
- Licensure
- Reimbursement
- Standards of Care
- Technical standards
- Recommend strategy for policy development

5. Recommend Policies for Assuring Accountability, Conflict Resolution, and Collaboration

- Common principles for planning and action
- Roles of government and the private sector
- Legislative initiatives
- Reporting and evaluation: state data needs; Federal expectations
- Planning guidelines: business plans, needs assessments, clinician priorities, feasibility studies
- Assessment of efficacy, adequacy, and equity of resource distribution;
- Planning process for the future.

Additional information and the most recent reports of the Alaska Telehealth Advisory Council can be found at: **http://www.hss.state.ak.us/atac**

## H. Inuit Circumpolar Conference Telemedicine Report

*Provided by Dennis Tiepelman*

Inuit Circumpolar Conference-Alaska (ICC-AK) and one of several regional areas (e.g. Maniilaq Association in northwest Alaska) have been in the forefront of utilizing the new computer technologies in the arena of providing telemedicine and/or telehealth activities. These emerging technologies in telecommunication systems are being put to use to deliver improved medical care to remote areas via the satellite and computer internet capabilities.

Medical care provided by practicing professionals is still a prerequisite to quality healthcare, but the technologies have helped to spur a rapid response time and better diagnoses to any treatment plan and service provided between the physician and patient.

Through federal funding to promote and develop access to better healthcare in rural areas such as Alaska, telemedicine has been an emerging development of technology tools to connect village-based clinics to a regional hospital via computer internet service and video conferencing for those healthcare professionals. This has served to provide medical diagnoses and care through instant feedback of all effected providers and their patients being treated.

In one region, 12 Alaska Native (Inuit) communities have been linked via the Internet to a regional health center where all medical traffic uses the broadband service capability to have instant communication by telephone, facsimile machine, and digital video conferencing capability for patient care.

Internet service is available 24-hours a day. The technology is being used to arrive at comfort levels where improved healthcare is provided through greater access to specialty care in every phase of patient care. This is provided no matter where a person is located. Telemedicine is a “work-in-progress” and an emerging technology to utilize on an experimental basis.

Internet services through the use of broadband capability, and through the interconnection of satellite service, has allowed vast amounts of informational exchange to take place between rural clinics, and has provided access to the professional medical care of large hub communities. When necessary, even statewide access to specialty medical services is now available.

ICC-Alaska and Maniilaq Association have enjoyed a partnership with federally funded subsidies to promote better healthcare and cooperation with a telecommunications company. ICC and Maniilaq have been able to coordinate and provide access to

improved medical care with an evolving high tech service capability of an ultra modern telecommunications system.

Maniilaq is proposing in fiscal year 2001 to support its Information Systems department at $2 million. This is nearly 5% of the operating budget for the organization. Maniilaq Association expends 70% of its operating budget on direct and related costs to the provision of healthcare in northwestern Alaska.

## I. RAIPON Telemedicine Report

### Peoples of the Russian North, Health Care System, and the Prospects for Development of Telemedicine

*Provided by Larisa Abrutina*

Healthcare and medical services in the Russian Federation have always been connected with difficulties. Among these difficulties are the country's vast territory, variety of climatic and geographic conditions, cultural differences and social problems, and political and economic instability. Nevertheless, a powerful healthcare system, albeit one lacking in some ways, was created in the USSR and has functioned effectively.

The most problematic areas of Russia have always been the North and the Far East. In addition to the difficulties characteristic of the whole country, these regions create a number of specific problems, defined by their extreme geophysical location, remoteness from the center of the country, and other elements. The main difficulties in providing healthcare in the north are:

1. Enormous areas and extremely low population density make providing healthcare and medical assistance difficult, especially with regard to standard staffing policies, which are based on population and do not consider the degree of the population's mobility and the area over which it is spread.
2. Heterogeneity and extreme climatic and geographic conditions, which play an unfavorable role, are some of the causes of high illness rates among the population and are factors that make providing medical assistance difficult.
3. Remoteness and poor development or absence of roads and communication lines create huge difficulties in supplying necessary goods and drugs as well as in transporting them to the major part of the North, Siberia, and the Far East.
4. Poor economic and sociocultural development of the Northern regions, in comparison with the central areas of the country, has always been the cause of a more frustrating situation for residents of the north and worsened dramatically with the beginning of market reforms.
5. A heterogeneous population which can be conditionally subdivided into at least three groups:

- A migrating population that comes to northern areas on contractual or another basis and, having worked a certain number of years, returns home to non-Northern areas. Almost all of this population lives in cities and towns.
- A permanent population represented by the descendants of those who migrated from European or other parts of the former USSR in the second or later generations. The majority of this population lives in rural areas.
- Native peoples of the north that are in turn subdivided into a variety of ethnic, territorial, and social communities. As a rule, the native population lives in small rural settlements, villages, or outposts, or they live a nomadic existence in areas of traditional resource consumption.

It goes without saying, that each of these groups requires a special approach in terms of the provision of healthcare and medical services. This is a complicated task and is not always achievable.

Paradoxically, the causes of these problems were not accessible and had various forms.

**Organizational Inaccessibility**

The entire healthcare system was created using templates for the country's central regions and was tied to the villages, settlements, and towns in which the natives supposedly lived. In reality, many natives were only registered in communities to create the illusion of their transition to a settled way of life. They lived in a variety of small nomadic camps scattered over large areas. The constant instability and turnover of healthcare personnel also contributed to organizational inaccessibility.

Large distances, climate, landscape, and the absence of roads and dependable radio and telephone communication created geographical inaccessibility.

The absence of public transportation and the lack of money to pay for such transportation even by a group of people constituted economic inaccessibility.

The particularities of traditional means of making a living did not allow people to leave the workplace even in cases of serious illness. This caused industrial inaccessibility as well as statistical inaccuracy.

The most serious form of inaccessibility is psychological. Medical personnel and patients belonged to different cultures and had different worldviews.

All these deficiencies influenced the work of mobile medical services, which have existed since 1924. Since their creation, these services have always been at the center of controversy. On one hand, government authorities and healthcare leaders understood that in providing services to native populations, particularly to nomadic people, they had no alternative to such mobile teams. On the other hand, putting together these teams of specialists was very complex due to extremely difficult

working conditions and low pay. Additionally, a characteristic feature of mobile teams' work is a relatively small number of residents in the villages and territories of traditional settlement who might receive services. This inevitably leads to a contradiction with standard staffing policies, which are based on population size, and significantly do not conform to stereotypes of medical personnel, and who do not understand the importance of mobile services. Because of this, mobile medical teams were constantly subjected to metamorphosis. First, the groups were created and promised a bright future. Then gradually they were reduced to narrowly specialized x-ray and Tuberculosis teams. The positions were then reclassified and personnel transferred to stationary hospitals. However, when the health of the natives deteriorated, the teams were "re-invented" and the cycle repeated anew. Such was the situation in the '30s, '60s, and '90s.

**First Particularity**

For many years Russia has walked along the path of quantitative development of the network of healthcare services in the north. In nearly every village, a medical facility with qualified personnel, laboratories, and simple equipment existed and continues to exist in spite of the crisis. Doctors and other village medical personnel can provide diagnoses on a professional level and prescribe treatment. Due to the crisis, all of this is failing, but it would be worthwhile to devote a relatively small amount of funding to purchasing medicine and supplies to revive a system that is being artificially destroyed. This differs somewhat from the situation in Western countries, where highly qualified specialists and healthcare facilities may be located far from a population, and accessibility is obtained through various means of communication.

**Second Particularity**

The means of communication in the northern areas of western countries are better developed than those in similar regions of Russia. In the west, there has always been a variety of radio and telephone communication, a network of roads, and an abundance of snowmobiles, airplanes, automobiles, and other means of transportation. In this environment, telemedicine is the normal outgrowth of an already developed communication system that provides the population with accessibility to healthcare. In the Russian north the situation is very different, where the means of communication are poorly developed. There are no roads or passable transportation, and radio and telephone communication is imperfect. Moreover, since the beginning of the crisis the situation has worsened considerably. If previously all the reindeer breeders, fishermen, and hunters were equipped with radios and communicated daily with a central post, now the number of radios has been reduced dramatically, and in any event there is no one to communicate with. There are no longer any sovkhozs (collective farms) and no money for equipment or repairs. The telephone equipment in many villages is so old that residents may not have connections or communications for weeks. For example, in the settlement of Omolon, Chukotka, no airplanes landed or telephone communications established for a month in early March 2000. Add to this the fact that there are also no roads even on the snow. It is 400 km to the nearest

regional center and there are more than 1,000 people living there. The settlement has a hospital with 15 beds and a doctor but no medicine, and the settlement experiences shortages of the most important foodstuffs. Reindeer breeders roam from place to place over an enormous territory and are even more removed from the settlements.

For these groups of people, telemedicine presently sounds like a fairytale. With the current condition of radio and telephone communication it is simply impossible to implement televised medical consulting. Even if we assume that the necessary equipment has been installed in some village as an experiment and we could provide consulting for the most seriously ill patients, what would this change? A village doctor does not even have elementary medications and transporting a patient for treatment elsewhere is impossible due to economic and transportation conditions. Often patients with cancer have to wait months for the opportunity to fly out for treatment. This does not even address “secondary” diseases.

A more realistic approach would be to install telemedicine equipment only in regional centers, where reliable, direct long-distance telephone communication and necessary specialists are available. However, it will be difficult for patients from remote villages and settlements to get to such regional centers. As a result, it turns out that telemedicine is a benefit of modern civilization, available only to the residents of administrative centers. Additionally, these large administrative centers already have healthcare and research facilities where one can receive treatment with no need for consultations with Moscow.

In modern Russia's current condition, a telemedicine network is viewed as an expensive toy that serves as a subject of prestige or satisfaction of scientific curiosity, but helping people very little. At the present time, a more topical issue from medical and moral points of view is equipping the native communities that live a traditional way of life with simple radio stations. These radio stations could be used to call for emergency medical assistance or, even better, to receive medical consultations from specialists serving in their regions.

Of course, this does not mean that telemedicine is not needed. On the contrary, one can confidently say there are no alternatives to telemedicine, especially in the conditions of the north. However, telemedicine would clearly be the next step, and to implement it the following must be considered:

1. This type of service should not become privileged, as has often happened with other types of assistance.
2. This type of service should be applied.

One way to achieve these goals is to include organizations of northern native peoples, especially healthcare services, in creating and implementing telemedicine projects. I am confident that these organizations could successfully make a place for telemedicine in the healthcare system of northern Russia.

If sufficient financing becomes available, it would be possible to conduct an experiment on developing such a service in one of the regions in the Russian North. This region could be the Bilibinski District of the Chukotka Autonomous Region, located in the western part of the region and having an area of more than 170,000 sq. km. There are five native villages and several industrial settlements in this district. There are no conventional paved roads and some areas have only "winter roads." Many natives lead a nomadic lifestyle.

To increase the efficacy of medical services in remote areas, it would be expedient to develop a Health Center (HC). There is already some experience creating these types of facilities. This center would be equipped with a powerful radio station, and all the native villages and nomadic communities would have less powerful mobile radio stations. HC personnel would have regular communication with all parts of the region and provide remote medical consulting, if necessary turning to the CRH (Central Regional Hospital) for advice. Along with the HC and its radio consulting services, we could install and use computer equipment to process and transmit medical data from the Bilibinski HC directly to Moscow. There would be no need to send information through an intermediate point in Anadyr. Such a system would be unnecessary and expensive and would increase the response time. Developing the HC outside the healthcare system as a non-profit organization would allow us to overcome the barrier of stereotypes about the competence, functions, and biases toward new types of services that exist among medical personnel. Additionally, this would prevent the new service from being formalized and bureaucratized, and would provide equal access for both city and village residents, natives and non-natives.

Allow me to consider your invitation to this Arctic Telemedicine Workshop in Washington DC as the beginning of our cooperation. Thank you very much.

RAIPON can be contacted at: **http://www.raipon.org**

## J. Saami Council Telemedicine Report

*Provided by Aino Snellman*

There are Saami people living in four different countries: Norway, Sweden, Finland, and Russia. Several Saami languages are spoken in different parts of the Saamiland, with part of the Saami being bilingual in Saami and the majority language of the country, part being monolingual in Norwegian, Swedish, Finnish or Russian, or part being monolingual in Saami. The Saami area consists mostly of small communities remote from hospitals, but there are Saami people living in cities, too. There are quite a few Saami and Saami-speaking health professionals, but they are scattered over a vast area, often lacking contact with colleagues. There are few specialized Saami health services, but there is a conglomerate in Karasjok, Norway with a Saami Outpatient Clinic (internal medicine, otholaryngology, orthopedics, pulmonology, and dermatology) and a Saami Child Psychiatric Clinic.

There is a well-developed telecommunication network in Scandinavia, with a good coverage of mobile phone networks and the possibility for use of ISDN. For the most part, there is also a telecommunication network outside the communities where the reindeer herders move. The situation in Russia is different. Phone and fax are the only telecommunications available to the hospital in the Saami community, and traditional radio transmission is available on the tundra where the reindeer herders work.

In the Saami area of northern **Norway**, various telemedicine tools are in daily use. Tromso University Hospital is giving distant education to health professionals all over northern Norway. Teleradiology and telepathology are used between hospitals. The university hospital is also giving distant dermatology service to a remote hospital. Not all, but many of the local Primary Health Centers have access to videoconference. The scattered psychiatric service is not only using videoconferencing for meetings and supervision between psychiatric professionals, but also for distant patient contacts. The Saami Child Psychiatric Clinic is giving distant education and supervision to professionals in social and healthcare in remote communities. As for emergency care, systems of transmitting electrocardiograms from a patient's home to the hospital specialist are developed as a part of "Thrombolysis outside hospital" projects. The university hospital has offered the Saami families of patients from distant communities the opportunity to meet their family members in videoconference, but so far there has been little interest in this service.

In the Saami area in **Sweden**, the only telemedicine tools are an electronic data network for healthcare with all transferring of patient documents between units of healthcare. Teleradiology is used between some primary healthcare units and the hospital. Videoconferencing is not used in healthcare.

In **Finland**, the first initiatives and experiments of telemedicine came in a Saami community in the early 90s, but later this community (being too small and too remote) was thrown out of the only telemedicine project of northernmost Finland. In the future, this telemedicine program of the Provincial hospital is going to cover the Saami communities too. It includes distant education to health professionals, videoconsultations in different medical specialties, and an electronic patient document system.

So far, the Saami in **Russia** have no access to modern telemedicine. The Saami Lovozero community is cooperating with Norwegian Karasjok in healthcare, and because of this cooperation the situation is not as disastrous as in many other Russian indigenous communities. The hospital has telephones and telefax. There is a plan to establish electronic electrocardiography consultations between Lovozero hospital and a cardiologist in Karasjok. The hospital has no access to the Internet, and there is no mobile phone network in the community. There is a satellite phone connection to a couple of remote communities. For emergencies outside the community, the reindeer herders can use radio contact with the hospital.

## Future Concerns

Saami patients often prefer to communicate with a Saami-speaking health professional or one who knows the local culture and living conditions. The local professional using tools of telemedicine can be an important link between the specialized medical care and the indigenous patient. With the use of videoconferencing, more Saami patients could discuss their health problems with a Saami physician, which are not so many. The hospital specialists might also benefit by having videoconferences with the Saami health professionals when discussing care of Saami patients.

Outside Karasjok there are Saami health professionals scattered in a vast area with a need to meet colleagues and discuss specific problems of the healthcare of the Saami. There is a need for more distant education and meeting places. The effective use of videoconferencing would promote professional development and update the knowledge of the health professionals in remote communities, and thus also promote recruitment and stability of health staff in these communities.

The Russian Saami would benefit from the use of the Internet. It would make it easier to keep contact with their Scandinavian partners in the cooperation projects and improve possibilities for distant learning for healthcare professionals.

## Comment on the Situation of the Russian Arctic Indigenous People

The most urgent problems of the Russian arctic indigenous people cannot be solved with the help of telecommunication. There are people starving, without proper food and shelter, in dissolved social structures, and people without the right to use the resources of their land and waters. The former healthcare systems are liquidated and for many indigenous people, especially nomadic peoples, there are no functioning health services today. The whole situation is a genocide.

The nomadic people often have no way to contact healthcare providers even in emergencies. The previous healthcare workers have been taken away from the reindeer herding brigades, and the previous radio equipment is often out of function. The sad situation is that there is often no healthcare at all. A system with a trained Community Health Representative in each nomadic unit with access to a mobile satellite telephone could perhaps be of some help in delivering healthcare to the nomadic peoples.

Telemedicine cannot cancel genocide, but telecommunication can be used for publicity, to collect up to date information from the remote Arctic communities, and to make the world know what is happening to the health and healthcare of the Russian arctic indigenous people.

## VI. Recommendations and Conclusions

**Recommendation 1:** Telecommunications in the Arctic should be in place to support efforts for telemedicine. If systems are in place, affordable, and reliable they will be utilized for healthcare delivery.

Reports for the past thirty years have anticipated enhanced telecommunications in the Arctic as a significant step toward improving the delivery of healthcare and the training and retention of staff. Supporting expanded telecommunications for northern communities improves healthcare delivery and expands the abilities of the tele-community.

**Recommendation 2:** Health professionals working in the Arctic need to be trained to fully utilize the telemedicine tools that are or will be available to them in the communities they serve.

As technology is implemented in remote health clinics, staff must be able to fully utilize these tools. Personnel in the field must be trained to make use of the latest equipment. As new healthcare professionals are trained they should have the experience to use the technology that will be waiting for them at their remote work site. This training will encourage recruitment and retention at remote arctic sites.

Telemedicine provides information in two directions. Remote healthcare providers can maintain skills through consultations in regional centers, and cultural and local contact can be maintained with patients who have had to leave their community for healthcare. Regional providers must therefore also be trained to fully utilize the potentials of telemedicine.

**Recommendation 3:** New endeavors in the field of telemedicine in the Arctic should place a priority on the "front end" users in the most remote and underserved communities.

Although larger communities have received advanced health services, the most remote clinics are often the last to participate in upgraded technology. Every effort should be made to foster improvements at the most remote sites. In addition to the new technology, training efforts should be expanded to bring staff up to the level of proficiency required for the new interface. It is also important to assure that these remote sites are maintained and supported so the telemedicine system is complete and operational at all levels.

**Recommendation 4:** Efforts to inform the Arctic public on telemedicine programs and services should be initiated to gain greater acceptance for the values of quality distance delivered healthcare. In addition, this effort should raise the awareness of healthcare system administrators and managers of the various telemedicine tools available to meet their identified service needs. These efforts should also incorporate local and cultural practices.

With new technology comes the need to make informed decisions on what tools will best address community health needs. Local politicians and healthcare administrators must have access to current assessments of workloads and practices. In addition, community members must have a level of comfort in the distant delivery of healthcare through the newly developing telemedicine system. These processes bring community education and the experience of receiving regular and reliable healthcare close to home.

As arctic residents learn about the possibilities for expanded access to healthcare, they may desire to select services from practitioners from a variety of sources. Existing structures of health delivery may not be the most appropriate or desired source of care. Indigenous people may consult health professionals from their own cultural background, albeit residing in other nations or distant states. Innovative programs that utilize customary and traditional practices can be shared with ease.

**Recommendation 5:** Telemedicine systems used in the Arctic should be spatially and temporally interoperable, and based on guidelines established in various existing international forums (such as the International Medical Informatics Association).

Since other international efforts are establishing interoperability guidelines, there is no need for the Arctic nations to establish their own. Encouragement should be given to the collaborative efforts that target concerns on how to share health information over both space and time. In addition, there should be a commitment to utilize these guidelines wherever possible within the Arctic.

**Recommendation 6:** Arctic programs should make use of the virtual meeting place provided through existing technologies, thus reducing the need for physical travel. Virtual conferencing can be utilized to identify needs, develop programmatic strategies, plan discussions, and organize structures.

As technology improves and telecommunication systems cover a broader area of the Arctic, the opportunity for reducing travel increases. The electronic production of arctic reports, as well as the ability to hold interactive discussions via web based virtual meetings, increases the efficiency and effectiveness of northern professional staff. The use of the virtual meeting place is another aspect of building the overall tele-community. Arctic communities are well positioned to become leaders in the use of virtual meeting technology due to similar regional concerns, but lack the ability to have convenient physical gatherings.

The Arctic Council can promote the use of virtual meeting places through their programmatic activities at all levels of interaction. All twelve of the arctic key contacts for telemedicine did not meet face to face during the process to prepare this report. Most did attend one workshop that was hosted by the US Department of State. The bulk of the work--of collecting, discussing, synthesizing, and compiling the ideas that form this document--have been shared around the arctic via some electronic format. This model is cost effective and can be replicated.

**Recommendation 7:** Arctic Telemedicine should be closely linked to the efforts of the Emergency Prevention, Preparedness, and Response (EPPR) Working Group of the Arctic Council.

The sustainability of programs is tied to the quality of the foundations upon which they are built. Specifically, telemedicine is linked to the efforts of other existing entities and structures that are at work in the Arctic. These include the existing telecommunications systems, emergency frequency agreements, and working guidelines established among the EPPR participants. Making use of these networks of expertise and existing national programs will foster the continued dialogue required to sustain the sharing of information on the advancement of healthcare delivery in remote arctic communities. These linkages need to be investigated to see how well they would address the requirements of sustaining Arctic Telemedicine.

These seven recommendations summarize many individual issues within the broad field of healthcare in the Arctic. They focus on significant aspects that are influenced by national activities and local programs. At the same time, they offer a circumpolar perspective with factors that are common to the far north. The Arctic Telemedicine Project can be a sustainable program of the Arctic Council if there is action on these recommendations.

In conclusion, the Arctic Telemedicine Project is a sustainable development project only as an ongoing effort. Without regular contact and testing of systems, the interoperability of the above listed endeavors will not be assured, and without regular dialogue there cannot be sharing of information. The objectives of preparing this report were to:

1. Share information on telemedicine programs.
   *This has been documented throughout this report.*
2. Define the problems that are commonly faced in the Arctic.
   *This has been discussed in this report and documented in Sections II & VII.*
3. Review the potential applications of the various aspects of telemedicine in the Arctic.
   *These are presented in the key contact reports and their commentaries in Sections IV & V.*
4. Identify the issues that can be addressed to improve telemedicine in the Arctic and make it sustainable.
   *Seven key recommendations have been made in anticipation of Arctic Council Ministerial action.*

The Arctic Council is a forum for international collaboration. The sustainability of Arctic Telemedicine depends on a consistent and complete telecommunications system for all of the nations of the Far North. The success of Arctic Telemedicine also depends on consistent and complete healthcare delivery systems in each of the nations.

## VII. Ideas, Issues, and Sources of Information

### A. Canada

***Materials from Judith Ross***

- Culture and the cultural appropriateness of telehealth services
- Socioeconomic impact of these services for remote and isolated communities
- Jurisdiction
- Liability
- Funding /remuneration,
- Linkages to existing health/medical services

**Information sites:**

Office of Health and the Information Highway

- Information Analysis and Connectivity Branch:
  **http://www.hc-sc.gc.ca/iacb-dgiac/ohoh-bsi**
- Medical Services Branch:
  **http://www.hc-sc.gc.ca/msb/fnihp/thealth_e.htm**

Canadian Society for Telehealth
**http://www.ucalgary.ca/md/CST/**

Industry Canada: Life Sciences Branch/Telehealth
**http://www.strategis.ic.gc.ca/telehealth**

The following video tape is available: "Telehealth in Canada - Breaking Down Barriers of Distance and Access."

### B. Denmark, Greenland, and Faroe Islands

***Materials from Thomas Stensgaard of Greenland***

In arctic areas, it is typical for people to live far from one another and in small communities where public health is often represented by staff with limited or no formal training. It is important to determine to what extent this staff can learn to use telemedicine equipment and submit relevant medical information to nurses/doctors and thus make better medical decisions. This then leads to better service for these small communities.

- Does the quantity and quality of medical services offered influence the preservation of these small communities?
- Transferring competence by using telemedicine.
- How do you select your telemedicine contacts, and to whom do you refer?

- Exchanging experience about problems during implementation and in the training of staff.

In another contribution, Thomas Stensgaard summarized some of the key issues that Arctic telemedicine needs to addess as follows:

- How do we structure the use of telemedicine to get it to work? How do we organize the use of telemedicine?
- How do we standardize (nationally)? *This is very much a question of organization.*
- How do we teach people to use it? *This is also organization, but much more than that.*
- How do we get the professionals (specifically doctors) to accept telemedicine? *This IS a problem.*
- Technology. *It does not always exist in the amount you want.*
- How do we implement telemedicine in a situation with lack of skilled people (and therefore a lot of things to do)? *This IS a problem.*

**Three Items for the Arctic Council Ministers**

1. Do you realize that we are having, and are going to have in the future, a problem with delivering qualified medicial services to people living in remote areas, at least if we have the ambition to avoid much traveling?

2. The traditional organization of the health system(s) is probably the most important barrier to the use of telemedicine.

3. The professionals are another very important barrier (reimbursement, new technology in a situation with an overload of work, etc).

**Workshop Report**

Since people in arctic regions are often scattered in relatively small communities, transportation is often somewhat erratic. Consequently, there is a tendency for people to move to bigger towns.

In public health, it is typical for people to present minor complaints that can be diagnosed and treated with simple means. However, it is also typical for people to have other complaints that can best be diagnosed and treated at highly specialized departments, which are only available in larger communities. This development towards more specialized treatment will continue.

In small communities, public health services are often in the hands of staff with limited or no formal training.

In places where the population is sufficient to employ professional medical staff, it is often a problem to recruit staff.

The distance between patients and those who can diagnose and treat is mostly overcome by travelling--either the patient travels to see the nurse/doctor or the professional person travels to see the patient.

The use of modern information technology can reduce the distance between therapist and patient. This expectation is not wishful thinking. For example, both telephone and fax have proved to be very useful tools. Therefore, we need:

- Apparatus (camera, scopes, ECG-equipment, etc) that can collect the medical information required,
- Transmission that can ensure safe transmission of this information,
- Staff who can collect and transmit this information, and
- Staff who can receive this information and act on it.

Currently, there are many products on the market, and new ones are appearing constantly. Having a national standard for these products would be desirable, especially within the same program. In any case, open communication is important among users regarding their experience with various pieces of equipment.

Money must also be considered. The wider the band, the higher the quality, but this also means higher cost. No one today doubts that the future lies on the (inter) net.

It is important to understand the extent that staff with limited or no formal education can use telemedicine equipment, and in doing so mediate relevant medical information to nurses/doctors to ensure better diagnosis and therapy. This involves education, motivation, organizing, workload, conservatism, and money.

It is also important to find ways to teach professional staff how to use telemedicine on a daily basis. This also involves education, motivation, organizing, workload, conservatism, and money.

Law must be considered in some countries, and especially if national borders are crossed.

Patients are probably the least problematic. Generally all patients are pleased with telemedicine, which is not surprising since telemedicine nearly always means better service.

Therefore, if we wish to implement telemedicine in a given area or situation, we must:

- Make a specification (geography, specialist, etc).
- Choose equipment (ask friends).
- Choose transmission (it is not always possible to pick and choose, and funds are limited); it seems that the future lies in network.

- Spot interested partners.
- Spot opposition.
- Spend a lot of time on training and motivating, and realize that at first telemedicine introduces extra work (give people extra money, if you have any to give); respect skepticism from people.
- Address opposition met from certain professional staff, and also respect that people in remote areas often work hard for the money they receive.
- Keep our eyes open to the impact telemedicine has on the established organizational structure.

If these aspects are kept in mind, plus a few things that have likely been forgotten (or are unaware of), a fine telemedicine program can be build--but will also be a lot of work.

## C. Finland

***Materials from Jarmo Reponene***

Local centers of telemedicine excellence:

- RHF-NF (Remote health Care in Northern Finland, Oulu):
  **http://www.ppshp.fi**
- CWT (Center for Wellness Technology, Oulu):
  **http://www.vtt.fi/tte/welfare_cluster/newhome.html**
- CHIRDEK (Centre for Health Informatics Research, Development and Education in Kuopio):
  **http://www.uku.fi/proj/chirdek/**
- HC-ICE (Health Care Information technology Center of Excellence, Satakunta):
  **http://husaari.pori.tut.fi/hc-ice/index.htm**
- MIRCIT (Medical Informatics Research Centre in Turku):
  **http://www.utu.fi/research/mircit/**
- EPTEK (Etelä-Pohjanmaan Telelääketieteen Palvelukeskus, South-Ostrobothnia Telemedical Service Centre):
  **http://eptek.sthol.fi/**
- Finn-Medi (Health Care center of Expertise, Tampere):
  **http://www.finnmedi.fi/fmt/finnmedi/contact.html**

## Types of Telemedicine services or applications found in Finland

| Application | Yes/ No* | Still Image transmission | Interactive Video | Healthcare Records Exchange | Reim-bursement applied | Comment |
|---|---|---|---|---|---|---|
| Geographical | | | | | | |
| TM between hospitals | Y | Y | Y | Y | N | |
| TM between hospitals and clinics/practices | Y | Y | N | Y | Y/N | |
| TM at home (Home TM) | Y/N | | | | | Remote surveillance |
| Call center for patients and citizens | N | | | | | |
| Functional | | | | | | |
| TM between doctors | Y | Y | Y | Y | Y/N | |
| TM between doctors and patients | Y | | | | N | Internet counseling |
| TM others (alert, epidemiology, research) | Y | | | | N | |
| CME via telemedicine | Y | | Y | | Y | Commercial videoconference lecture service |

*With an indication of magnitude for the most commonly found application in Finland.

Medical Specialty actually involved in TM in Finland (everyday practice + pilots/tests):

Radiology
Neurosurgery
Psychiatry
Surgery
Internal medicine
Pathology
Ophthalmology
Psychiatry
Dermatology
Oncology
ENT
Clinical Neurophysiology
General Practice
Gynecology
Gastroenterology

**Most common applications found in the telemedicine activities of Finland:**

- Tele-diagnosis (medical imaging, biosignals)
- Second opinion
- Grand round (Dx and Tx) (videoconferences)

- Diagnosis (patient) (videoconferences)
- Tele-surveillance of Physiological parameters of patients
- Education, CME (Continuous Medical Education)
- Exchange of parts of electronic patient record (EPR)

**Types of communication networks currently in use:**

- Frame relay (overwhelming majority)
- ISDN (videoconferencing, home on-duty)
- ATM (national backbone, in-house, between some major institutions)
- GSM Mobile radio (Doctors on-duty, ECG, Ambulance, teleradiology,)
- POTS (telephone) (earlier tests, minority today, home, internet)
- ADSL (not yet, possibilities for doctors' on duty calls))
- Satellite (no)
- Types of medical devices actually found in existing applications of TM in Finland

**Imaging devices (X-ray, CT, MRI, US, etc. equipment):**

- ECG
- EEG
- Eye microscopes
- Endoscopes
- Medical workstations

**The most important barriers to the adoption of telemedicine in Finland:**

- Education of personnel
- Lack of evaluation results
- Open question of reimbursement
- Interconnectivity and standardization of the patient record systems
- Too strict interpretation of data security laws while there is a need for patient information exchange

**What is actually done or planned to overcome them?**

1. Education is integrated in many telemedicine programs, university level education started.
2. FinOHTA evaluation project will report its results.
3. Discussion within the healthcare districts and between various players.
4. Participation to international (CEN, ISO) work, localizing HL-/ messages, national and regional guidelines.
5. New pilots, where more open models are tested, use of new technology (health cards etc), adjustments in laws, guidelines of good practice.

**What are the most pressing needs?**

1. Personnel education and training
2. Security issues, person's electrical identity
3. More evaluation results available
4. Standardization of information exchange

## D. Iceland

***Materials from Thorgeir Palsson***

There have been negative experiences with telemedicine in the past. These include:

- Quality of images
- Transfer time due to low bandwidth
- Level of utilization
- Level of acceptance

There have been positive experiences as well. These include:

- Increased services when needed
- Increased health worker and patient satisfaction

There is a need for the research and pilot efforts to become part of the daily delivery of healthcare services. Telemedicine needs to be intigrated into the healthcare system.

Telemedicine will increase specialist and consultative services to remote settlements aiding healthcare workers. Such interactions and other training programs will increase the competency of local health providers.

There is a need to have a list of programs, including their status and effects. Sharing creative funding solutions would help new programs. Guidelines for telemedicine utilization are needed.

Telemedicine is intimately linked to the level of telecommunications. As telecommunications systems change, telemedicine may influence the "hub and spoke" structure of the existing healthcare delivery systems.

## E. Norway

**Issues from the Norwegian Plan of Action 1997-2000**

- Standarization
- Coding and classification systems
- Information security
- Development of regulations

***Materials from Tove Sorensen***

- Basic telecommunication infrastructure in the Arctic due to the distances, terrain, and climate.

- Mobile telemedicine units that have very user-friendly interface, will cope with temperature extremes, are durable, and provide for translation among local languages.

**Two Items for the Arctic Council Ministers**

- Training and transferring of competence of unskilled staff in small remote communities by ways of telemedicine.

- Mobile units and telecom structure.

**Issues from Morten Dahl in Finnmark**

- Efforts to provide telemedicine services across national borders.

- Services between hospitals and outpatient clinics.

**Information Sites**

Review article Telemedicine in north-west Russia:
**http://www.qub.ac.uk/itt/jtt/jtt_19.html**

Telemedicine Reports - Norway:

- National Centre of Telemedicine
  **http://www.telemed.rito.no**
- KoKom national center on dispatch--works with the committee managing the national standards for radio communication in emergency services.
  **http://www.hibinc.no/kokom/English.htm**
- Nordic Evaluation Medical Technology report can be ordered from:
  **http://www.kf.kommorg.no/cgibin/samweb.exe/Sok?call=Bokoversikt&Fornavn=&Etternavn=&Tittel=Telemedicine&Varenr=&ISBN=&ArFra=&ArTil=&MaxTreff=5&action=Start=s%F8k**
- Norwegian Ministry of Health and Social Service "More Health for Each bIT - Information Technology for better Health Services in Norway." In Norwegian at:
  **http://odin.dep.no/shd/publ/itplan/**
- "Telemedicine in Norway: Today's Situation and Recommendations for the Future." 1999 in Norwegian at:
  **http://odin.dep.no/shd/publ/1999/telerapport/**

## F. Sweden

***Materials from Ingegard Malmros***

### Issues

- Promoting good health in remote areas of the Arctic
- Sharing of knowledge to save resources and increase efficiency
- Standardization--how to achieve compatibility between different systems
- Security, confidence, and integrity
- Legislation
- Internet working place for developing telemedicine
- Virtual conferences

Co-operation with the Arctic Region in the telemedical field will promote good health even in remote areas. It will be an effiecient way of sharing knowledge and saving resources. It will also facilitate the democracy processes, including gender discussions.

Issues to be discussed on exchanging information between nations:

- Standardization: how to achieve compatibility between different systems?
- Security, confidence, and intergrity
- Legislation

### Proposed Tool

A useful tool, especially designed for telemedicine, is needed in order to work efficiently.

Internet working place: In the Swedish project "Telemedicine Forum" (AFCEA Visby Telemedicine Chapter and Gotland University College), IP-based satellite telecommunication and Internet are intended to be used for creating a secure virtual meeting and working place, not depending on geographical positions. The security aspects are handled by catalogue X500/X509. The Telemedicine Forum will give the possibilities to work with projects, discussion groups, mailing lists, etc. Due to the catalogue function, searching for issues of special interest is also possible, and due to the very high securtiy level, patient data might also be exchanged.

Internet conference: The virtual conference will be organized with a web based secreatariat and internet broadcasting, handled by the secreatariat. This will permit a multinational, multidisciplanary collaboration, with participating nations responsible for the conference agenda on different days. Due to catalogue X500/X509 it will also be possible to work with a high security level and payment services. A software based conference bridge has to be set up for distributing the broadband videoconference possibilities. In the Nordic countries, the university broadband net will be available,

and for other countries, satellite telecommunication might be an alternative. Other functions will aslo be added, but the discussion is just now on-going between AFCEA Visby Telemedicine Chapter, Gotland University College, and some telecom agencies, and will end up in a description of project goals, structure, etc. This will all be completed by the end of December 2000.

**Information Sites**

**http://www.yoldia.com/telemed/framset.htm:**
**http://www.yoldia.com/konf9909/index.htm**
**http://www.algonet.se/~afcea/index_sv.html**

"Telemedicine Applications in Sweden 1998" The Arctic Telemedicine Project Coordinator has an English electronic version of this document (see: **http://www.spri.se/homepage.html**).

"Almost one third also believe that there is a major potential for international collaboration in telemedicine. More that 60 percent of the contacts and 85 percent of the hospital managers believe in a future international market for telemedicine services, for example, in highly specialized care and for very specific medical applications." (From the report's summary.)

Information about the results and on-going European Standardization of Health Informatics work can be found on the web site maintained by the Swedish Healthcare Standards Institution (see: **http://www.centc251.org**).

## G. USA

### *Materials from Dena Puskin*

The US Federal agencies tend to promote local options but do not plan large integrated systems. It is up to local governments to implement the programs, and it is to their advantage to have systems that are interoperable with others. In addition, the view of the US is that telecommunications is the backbone for the televillage. Telehealth is broad in definition and telemedicine is seen as the clinical application. Telehealth applications therefore depend on what services are to be provided. This then determines how well any telemedicine system addresses specific human conditions in a distant healthcare delivery program.

In the USA about 17% of the Gross National Product (about $2.1 trillion dollars) goes into healthcare, and yet there are underserved pockets of people, including a rapidly growing elderly population. There are questions about the quality of service and the flow of information breaking down. Early programs on telemedicine included dermatology, but the systems did not work well on people of color.

Major problems with telemedicine are people issues. Systems are not user friendly. There needs to be training, education, and opportunity for interface on the systems.

Economic fears emerge because practitioners may loose business. Psychological fears relate to the high costs of failed systems in the past. The barrier is not just money. Money is the key to sustainability, but it not the key to starting the system. There are also concerns about the depersonalization of the healthcare system, since "patients are walked past a screen."

Other concerns include the lack of consistently applied guidelines for utilization. There is a real "value added" to having clinical protocols for appropriate use. These can include a review of the technical aspects that are required in order to conduct a distant consultation.

There exists a list of evaluation questions that the US Health Resources Services Administration has prepared. These are available and should be used by any group that is planning to begin or expand its own telemedicine program. These questions are basic to all telemedicine programs and if addressed should provide direction in they type of healthcare delivery tools that need to be installed. There are other sources of information, and anyone looking implement telemedicine needs to know what has been attempted and what is working.

HRSA is producing a series of Guidelines for Technologies for its grantees. The draft report on dermatology is done. Others will be out in early summer and all will be placed on the following web site: **http://telehealth.hrsa.gov**. These guidelines will include the types of questions providers will want to ask vendors.

**Information sites:**

- Health Resources and Services Administration (HRSA) - Federal Telemedicine Gateway and State Links:
  **http://www.telehealth.hrsa.gov/links.htm**
- National Aeronautic and Space Administration (NASA) - Telemedicine, with links to many US sites as well:
  **http://www.hq.nasa.gov/office/olmsa/aeromed/telemed/**
- National Library of Medicine telemedicine symposium January 2000:
  **http://www.capconcorp.com/mln/telesymp**
- Alaska Telehealth Advisory Commission Final Report:
  **http://www.hss.state.ak.us/atac**
- American Telemedicine Association:
  **http://www.atmeda.org**

***Materials from Stewart Ferguson***

Alaska has a number of unique challenges regarding access to healthcare services. The geography and climate pose severe limitations on the distribution and provision of healthcare services. There are no existing road systems linking most rural villages, and travel between villages and a regional medical facility is often limited to air travel, weather permitting. In addition, families are often left behind for extended periods of

time in order to seek medical attention at a regional hub or even further away in Anchorage. This creates barriers of distance and timely access to care. Although there is little one can do to change geography or climate, there are telehealth solutions that can potentially impact various barriers described below.

**Gaps in healthcare services in many Alaskan communities**

Many healthcare resources, including an adequate number of physicians or mid-level providers, adequate facilities, and support systems, are not locally available in most Alaskan communities, thus requires travel by either the patient or the provider. As an example, the overall physician-to-population ratio for the nation is 255 physicians per 100,000 population. However, in Alaska this ratio is 151 physicians per 100,000 population.

Many communities throughout Alaska are located several hundred miles from a regional medical center and are designated as "medically underserved." The Indian Health Service/tribal entities provide essentially the only source of care in these communities through village clinics that are staffed by Community Health Aide/Practitioners (CHA/Ps). CHA/P's having approximately six months of on-the-job basic healthcare training which is delivered over a 1.5 – 3 year time span. They are clinically supervised at a distance by a physician or mid-level provider most commonly located at a regional medical center. Less than 12% of the 235 sites are staffed by physicians, and the majority of sites (67%) are staffed by CHA/Ps rather than mid-levels and/or physicians. Thus, in most Alaskan communities, access to a higher level of healthcare service is limited.

Federal beneficiaries also face geographic isolation and, as a result, have limited access to healthcare services and health information in their communities. Most beneficiaries prefer to receive healthcare close to home, thereby avoiding the high cost of travel and the increased risk of travel in unpredictable weather.

It is difficult to elucidate the level of isolation for many of the AFHCAN health sites. Transportation access between the site and the regional medical facility is one measure of professional isolation. Another measure of isolation is the designation of communities as frontier, rural, or non-rural. 97% (227) of AFHCAN sites are designated as rural or frontier, with over half of those rural sites being designated as frontier areas.

Providers of healthcare at all levels are isolated from higher levels of care providers as well as from networking with colleagues and continuing education opportunities. For example, CHA/Ps who serve as the primary source of healthcare in the large majority of Alaskan communities work under the clinical supervision of a physician. However, this physician is remotely located at the regional medical center. Communication between the CHA/P and the physician currently relies on telephone and/or fax technology. Patient management decisions about whether or not medication or travel is necessary are made daily during these consultations.

Thus, transportation access--not just distance from care, rural designation, and remoteness from higher levels of care--is a strong indicator of professional isolation.

Another measure of isolation is the inadequacy of the telecommunications' infrastructure at the AFHCAN sites. In mid-1999, 81% of sites relied on POTS, thus demonstrating the isolation of most AFHCAN sites in terms of limited connectivity. However, the availability of Universal Services Funds (USF) are producing dramatic changes in the speed of connectivity to AFHCAN sites. The overall expected decline in POTS connectivity from 81% in mid-1999 to 16% in mid-2000, and the significant increase in high speed dedicated connectivity via T1 and fractional T1 lines, is a result.

Many of Alaska's federally funded village clinics (159) are using old and inadequate communications systems. For example, there is no statewide electronic network linking healthcare delivery systems for most rural clinics. Current technology relies on satellite transmissions, which contribute to frequent disconnects. In addition, many have old electrical and telephone wiring and diesel power generators with many power fluxes, including brown-outs and black-outs.

The general cost of operating a hospital and/ or clinic, according to Blue Cross figures, is up to 300% more expensive in Alaska than in the rest of the US. According to the Indian Health Service, it spends more per-capita to provide medical and community healthcare services in Alaska than it does in any other area of the nation.

Costs for travel to access healthcare services that are not available in the local community are substantial. Air fares to the regional medical centers can range from $100 - $200, and airfare to the nearest tertiary care hospital can cost $800 - $1,200. Dollars for patient travel is the most expensive budget category for the Indian Health Service/Tribal Entities in Alaska.

In addition, healthcare services not available through the statewide healthcare delivery system may be purchased from private sources under the Contract Health Care Program. Services of physicians, dentists, optometrists, hospitals, and pharmacies, as well as patient travel, may be covered by contract health dollars as needed. The Alaska Area IHS/Tribal Entities FY2002 Budget Formulation Work Session held in February 2000 estimated $380,000,000 for annual contract health costs.

**Description of how AFHCAN will Benefit Rural Health Care Providers and Communities**

- AFHCAN is a mode of service delivery that makes it possible to extend the capabilities of healthcare providers in regional and remote sites. The hallmarks of this type of service design are the transportation of information and the access to a broad range of services through widespread entry points.
- Extend existing services and improve the quality of these services to rural communities.

- Shift the emphasis from the transportation of patients to specialists to the transportation of information from experts to the local provider and patient (i.e. to the point of need).
- Support "re-tooling" the diagnostic, communication, and record archival technologies around the state. Thus, the current "fax and phone" telecommunication system will be updated to a modern high technology and high capacity system that will serve our needs far into the future.
- AFHCAN will bring Alaska's widely distributed healthcare community "on-line." This will, in part, shift the professional isolationism to a "virtual community."
- With expanded telemedicine sites, patients should find it easier to get the medical help they need closer to their own community. Staying within the community for appropriate treatment also minimizes the amount of time individuals will need to take off work and family duties to obtain needed medical care.
- It is expected that telemedicine capabilities will improve the quality of care available to remote patients. Patients will have access to specialists more quickly, allowing for earlier intervention. Also, patients who previously have not had access to specialists will benefit from this system.

**AFHCAN Clinical Focus Areas**

AFHCAN will focus on the implementation of the following clinical applications using telemedicine equipment over the next three years. These applications have been chosen based on healthcare needs, feasibility, and potential impact on patient care as identified by the regional organizations.

Ear Disease

The incidence of otitis media, its morbidity, and burden to society has been well documented. Sixty-eight percent of presenting complaints require an ear exam. Otitis media costs at least $134 to $239 per patient per year in the rest of the USA, and national expenditures are estimated at 5.3 billion dollars.

Acute otitis media represents ten to fifteen percent of Alaskan village encounters, and may result in hearing loss and other morbidity if not properly treated. Accurate diagnosis of ear infections can be challenging. There is a need to assist Alaskan village CHAs with accurate diagnosis of ear disease so that treatment is appropriate and antibiotics are not overprescribed. There is an additional need to increase access to otolaryngology specialist consultation without having to travel.

Pediatric Dermatology

Common skin problems in pediatrics include atopic dermatitis, seborrhic dermatitis, urticaria, candidiasis, tinea fungal infections, impetigo, molluscum contagiosum, warts, acne, scarlatina and the pediatric exanthems. The exanthems are systemic viral illnesses with skin manifestations such as measles, roseola, rubella, and chicken pox, which are often challenging to differentiate.

In Alaska, all of the typical and some atypical skin problems exist. Children are often transported from villages to regional centers in order for physicians to make a dermatologic diagnosis. There is a need to support remotely located providers in the diagnosis of skin disease. Telehealth can provide specialty consults in dermatology for all practitioners throughout the state.

Other conditions being addressed include: Adult Dermatology, Acute Wound Management, Cardiology, Alcoholism, Psychiatry.

**AFHCAN Equipment**

The AFHCAN Project Office, in conjunction with Alaska Clinical Engineering Services (ACES), has actively reviewed, researched, and tested a large range of hardware options for Phase I of the AFHCAN Project. ACES, the biomedical services department of ANTHC, works with AFHCAN throughout the life of the project with a focus on selection and testing of hardware, in addition to being responsible for deployment and installation of the equipment at the various sites. Statewide committee input, especially from the Clinical and Technology Committees, has been key to the selection of the biomedical devices. In some cases, the manufacturers have modified the equipment to meet specific needs of the AFHCAN project.

Phase I equipment provides the necessary hardware and software to obtain, view, and store patient data (computers and hardware); move patient data (web server); and create hard copy records of patient data (printer). The actual amount of equipment to be installed at each site will depend on workload, specialty services, and type and mix of healthcare providers.

***Computers and Hardware***

- Acquisition workstation: Consists of a computer (CPU), a touch-screen monitor, and biomedical equipment to acquire patient data when creating telemedicine cases, and to display patient data when viewing these cases. The CPU contains: a graphics card to support accurate color calibration, a frame grabber to freeze diagnostic-grade images from multiple video sources, and remote trigger switches to capture data. The touch screen is specifically designed to allow accurate color representation over a wide viewing angle both horizontally and vertically. To ensure the entire system meets federal patient standards for allowable leakage current, a specific "low leakage current" CPU is coupled to a health grade UPS, to opto-isolated trigger switches, and to FDA approved biomedical equipment (ECG, otoscope, etc.).
- Video Otoscope: Commercially available video otoscopes have been tested and reviewed by AFHCAN staff and several statewide committees. The selected otoscope (Welch Allyn) has since been modified twice by the manufacturer to meet AFHCAN specific needs, including a rugged sheathing (to protect and bind the fragile cables) and a modified barrel to better support pediatric specula.

- Digital Camera: AFHCAN staff are currently completing the tests of recently released digital cameras and receiving clinical feedback from dermatologists on the diagnostic quality of the resultant images.
- ECG: Commercially available ECG equipment with computer interfaces have been tested and reviewed by AFHCAN staff and several statewide committees. The selected equipment manufacturer (Brentwood) has provided a version of their award winning software that can be readily integrated into the AFHCAN software package.
- Scanner: AFHCAN staff are currently completing the testing of scanners, which will allow providers to scan the hand-written encounter forms and include these with telemedicine cases.
- Cart/Wall mount: AFHCAN staff are currently completing the design of a mobile care and wall-mounts that support the acquisition and biomedical equipment.
- Display station: A standard computer and monitor for reviewing, responding, and forwarding cases. Make and model is specific to the preference of each organization to maintain consistency for organizational Information Systems support policies with current vendors.
- Web server: The AFHCAN software is web-based, therefore a web server is required at each site unless the site is connected by a dedicated wide area network (WAN). The AFHCAN Project Office will be working with each organization to determine compatibility of existing servers with AFHCAN software. The server runs a web Server application (e.g. IIS or Apache), Cold Fusion Server (available for WinNT, Linux, and Unix), Database server (e.g. PHP, SQL Server, or other ODBC compliant databases), and a backup/archive strategy.
- Printer: A color laser printer is recommended at regional facilities and a color inkjet printer is recommended at village clinic locations. The AFHCAN Project Office recommends specific makes and models (currently HP970 for inkjet and HP4500 for laser), but will assess the compatibility and clinical viability of existing printers with software developed by AFHCAN. Small print servers are included in the hardware design to allow the printer to be located at any point in a facility without regard to the location of workstations or servers, to maximize the availability of the printer.
- Wireless network: The majority of sites are stand-alone village clinics that currently have no existing network wiring to support workstations, servers, and printers. A major support problem has been recognized in such clinics when network wires are haphazardly run along walls and floors, resulting in damage to cables and plugs. A wireless network resolves these problems and has the range to be installed in any Alaskan clinic. All major wireless solutions have been reviewed and tested for range, interoperability, security (encryption), robustness, etc. The selected network will include network interface cards in all computers with one or more base stations as required to interconnect the components.

- Network Router: A Cisco router serves as the edge device (i.e. the demarcation point at which the AFHCAN network is connected to the organizational local area network (LAN) or wide area network (WAN)). Each organization will require at least one such router. The AFHCAN project office will work with each organization to determine the exact configuration of the router, including the need for a modem backup plan.
- Video Conferencing Equipment: AFHCAN Project Office has extensively tested both LAN and POTS-based video conferencing solutions over a variety of simulated lines (variable speed WAN, variable-noise POTS). Extensive on-site testing at village clinics and regional hospitals indicates that the most cost-effective solution on FT1 and T1 lines is the Polycom 512 model.

***Software Development***

The AFHCAN Project faced a difficult choice in selecting software for this project, due to the wide disparities between the site involved in this project. The extremes in operating systems (institutional Windows 2000 servers/workstations, versus institutional UNIX servers/X-Windows clients), the range in connectivity (1200 baud versus T1), and the range in user capabilities (no computer experience to Microsoft Certified Systems Engineers) ultimately led the AFHCAN Project to focus on a minimal software package that was capable of running on a variety of platforms (Unix, Windows, Macintosh, Linux) and capable of inter-organizational transmission of data.

The following table indicates a partial list of vendors whose software products were considered for this project:

| Vendor | URL |
|---|---|
| 2nd Opinion | http://www.2opinion.com |
| Access Radiology | http://www.accrad.com |
| AccuSoft | http://www.accusoft.com |
| Aethra | http://www.aethra.com/ |
| Akamai, PIHCP | http://www.matmo.org |
| American TeleCare Inc | http://www.americantelecare.com |
| CermUSA | http://www.cermusa.org |
| Cognitive Communications | http://www.cogtel.com |
| Confer Software | http://www.confersoftware.com/ |
| DeJarnette Research Systems, Inc. | http://www.dejarnette.com |
| Global Telemedix | http://www.globaltelemedix.com |
| Image Labs | http://www.imagelabs.com |
| Intelemed-USA | http://www.intelemed-usa.com |
| Intracom | http://www.intracom.net/echolive.html |
| Medvision | http://www.medvis.com |
| MedWeb | http://www.medweb.net |
| Neuro-Eye Diagnostic, P.A. | http://www.neuroeye.com |
| T2P2 - PRPO | |
| Siemens Corporation | http://www.siemens.com/ |

| Vendor | URL |
|---|---|
| Simplex Knowledge Company | http://www.skc.com |
| SMS | http://www.smed.com |
| TMAC | Error! Hyperlink reference not valid. |
| Vidimedics Corporation | http://www.vidimedix.com |
| VITAL (New Bruswick) | http://www.gov.nb.ca/nbfirst/index.html |
| ViTel Net | http://www.vitelnet.com |
| WANG | http://www.wang.com |

The AFHCAN project mandated that any software package must minimally be able to work in a stand-alone fashion (in a remote clinic without dedicated access), must be able to transmit data to multiple sites in an asynchronous mode, must support international standards for data format (HL7 and XML), must support all required hardware devices, and must have an extremely simple interface. In addition, the State of Alaska, through ATAC, developed statewide technical standards. Sustainability mandated that initial, as well as ongoing support/upgrade costs, should be minimized. A comprehensive search of the capabilities of commercial software led to the conclusion that AFHCAN would be best served through the development of it's own project software.

The acquisition and transmittal software being developed by AFHCAN is web-based, very user-friendly, and secure. The software solution is designed to provide quick access to clinical instruments (such as video otoscope) without delays associated with first entering patient data or opening cases. The software integrates with a touch screen that allows users to easily attach images, data, and create telemedicine cases. It allows users to simply display images for teaching, or save images for telemedicine cases. Text can then be entered into an electronic patient encounter form or be scanned in from handwritten documents.

The software is designed to restrict access at several levels. Administrators may modify system settings, restrict user access, and restrict connectivity to other sites. Individual users, depending on their security level, may have the ability to create, view, respond, or refer to telemedicine cases.

The software allows users to view telemedicine cases that are actually stored on a web server. The software allows users to view telemedicine cases on any major browser product (i.e. Microsoft Internet Explorer version 4.0 or later, Netscape Navigator) with most operating systems (i.e. Windows 95, 98, or NT, MacOS, X Windows). The acquisition software, however, (capturing images from the otoscope or digital camera) will only run on the Windows platform (Windows 95 or later).

Other than the browser on the workstation, all software developed by AFHCAN, and all telemedicine data, is located on the web server. This provides one point of software upgrade and one point of data archive for the organization. This server connects with other web servers to transfer cases to and from sites. The transmission uses Secure

Socket Layers (SSL) to meet federal security standards for patient data. The software features minimize the amount of data that must be transferred between servers and reduces transmission costs by never transmitting binary data (e.g. images) that have already been transmitted.

Significant advantages are being accrued from the development of an AFHCAN software package. The user interface can be tailored to the lowest common denominator of user-experience at the AFHCAN site - specifically a user that has no computer literacy. The interface can be designed to work directly with specific biomedical equipment (e.g. otoscope and ECG) without requiring the user to store images as file names in folders etc. The software is based on open standards with very few compiled components, allowing future growth and development without any restricted or proprietary components. Adhering to basic web design and a widely-developed Cold Fusion basis, many developers can participate in future development. Employing international standards for data formats and transport (XML and HL7) promotes the future interoperability with emerging technologies that are being tested in Alaska (e.g. GCPR) to facilitate inter-agency patient data sharing.

**Clinical and Training Program Activities**

The clinical instruments selected and approved by the AFHCAN Project Office in collaboration with the Clinical and Training Committees for Phase I deployment are: 1) video otoscopes, 2) digital cameras, and 3) 12-lead ECG. Initially, the clinical emphasis will be on the practical applications in primary care medicine, dermatology, and otolaryngology.

One of the key lessons learned from other telemedicine initiatives is that adequate training must be built into implementation. The AFHCAN telehealth curriculum being developed for telehealth training is modular and is adaptable to meet member organization training requirements, and will be based on equipment selected for deployment.

The AFHCAN training program being developed is targeted for use by trainers of: CHA/Ps, nurses, mid-level practitioners, physicians and other providers, and ancillary/administrative staff.

Community health aide telehealth training is comprehensive and includes keyboarding skills and application usage, otolaryngology and dermatology review, telemedicine imaging and referral, and equipment maintenance and troubleshooting. Emphasis will been placed on obtaining high quality images, clinical data, and ECGs to send to the receiving providers. Education materials will include a reference manual, CD-ROM, quick reference materials, and training videos.

The full community health aide training course qualifies for University of Alaska credit. Member organizations may opt to develop training locally or may wish to select from a menu of materials developed by the AFHCAN Project Office. Alternatively, they may

request the AFHCAN Project Office to train local trainers or to train community health aides and medical staff directly.

Physician and other provider training is being implemented as a continuing medical education program sponsored by Alaska Native Medical Center in Anchorage and regionally. Initial telemedicine CME will concentrate on equipment, integration of telemedicine into the clinical setting, dermatological and otolaryngological imaging techniques, and quality assurance. Additional training for providers on telemedicine topics are planned as part of formal AFHCAN training for delivery at medical, midlevel, and nursing conferences throughout the state.

**Assessment Planning**

Prior to Phase I deployment, member organizations participate in an assessment planning process for each of their sites. The Phase I assessment consists of a participation survey, an equipment selection worksheet, and a site visit/pre-deployment survey.

The Participation Survey is designed to assist each member organization in determining their desired level of Phase I participation. To prepare for telemedicine, member organizations were encouraged to organize Tele-health Teams, to develop a strategic and tactical approach for telemedicine, to assess needs and readiness, and to select equipment based on those needs.

The Equipment Selection Worksheet outlines equipment options and purchase costs. The Recurring Cost details the estimated annual recurring costs.

Site Visits/Pre-Deployment survey to member organizations are a part of the assessment and deployment planning process.

**Monitoring and Evaluation**

The monitoring and evaluation is based on the concept that this project is a test of a full scale implementation at federal healthcare sites throughout the state of Alaska. Each objective with its specific method and activities has a corresponding evaluation component. Monitoring and evaluation will occur throughout the duration of the AFHCAN project and is primarily focused on data collection and analysis to guide decision making.

A proven quality improvement cycle such as Plan, Do, Collect, and Act (PDCA) will be utilized. Results of monitoring and evaluation efforts will be presented to the appropriate committees and boards and travel forward to process improvements.

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## H. Aleut International Association

***Materials from Debra Fannin, a former key contact***

Two biggest problems are transportation and facilities.

The weather on the Aleutian Island Chain is notoriously bad, and efforts have gone on for six months (on two different islands) to get a 56K line run from the receiver station to the clinic in the community. Getting the technicians to the islands has not occurred. Computer equipment is shipped in small five passenger planes that fly twice a week, if the weather permits and if the plane is not down with mechanical problems. Passengers and essential items often "bump" such equipment off flights due to the very limited space.

Some of the old clinics are poured concrete and also contain asbestos. None are wired with data jacks and some need their entire electrical wiring brought up to code. The airports are small and cannot accommodate larger aircraft, and there is no funding to improve the runways. In addition, any heavy equipment needed for the work would have to be barged in at high cost if there were suitable docks or disembarking areas.

The health facilities have very limited space, and have old electrical and telephone wiring. They have local diesel power generators with many "brown outs" and power surges. Irregular heating systems often result in freezing conditions. If the equipment is put in place there will also be sustainability issues of maintenance, upgrading, and training of the healthcare providers.

Having working telemedicine systems in place would increase healthcare access, decrease isolation, and increase education. Without the infrastructure and support to keep the system functioning, it is likely that the equipment will end up in the basement because nobody knows how to use it.

In Alaska, equipment that is sent out and not utilized is known as "silicon shipwrecks." Not having the physical infrastructure in the clinics is known as the problems of "the last mile."

Additional information on the Aleut can be found at: **http://aleutcorp.com/**

## I. Inuit Circumpolar Conference

### *Materials from Dennis Tiepelman*

Telehealth is a "work in progress," and faster tools provide for a better healthcare process. Telecommunication connects tribal governments so they can govern themselves. It is expensive and not really cost effective, but is very important for the viability of remote communities.

It is important for telemedicine to be oriented in order to find better ways to deliver healthcare at home. It is hard on families and for individuals to travel long distances. Telemedicine should enable community health practitioners to become more self-sufficient. It should allow for the collaboration and coordination of efforts.

Additional information on the Inuit can be found at:
**http://www.inusiaaat.com/icc.htm**

## J. Russian Association of Indigenous Peoples of the North

### *Materials from Larisa Abrutina*

RAIPON is made up of many different ethnic groups, many of whom have led a nomadic lifestyle. In the past, mobile medical teams traveled to provide healthcare. However, with the fall of the Soviet Union, hospitals have closed, health providers have left, and even the basic radio communication systems are no longer in place.

In the past, the mobile teams monitored infectious diseases such as tuberculosis. Russian community health clinics cannot begin to think about computers and sophisticated telecommunications. People are faced with basic health needs of food, water, and sanitation.

There are problems with the delivery of healthcare in such a large area. It is expensive to install the latest technology in so many places at one time. The weather is a constant problem and is hard on equipment, but at the same time this is why telemedicine could contribute so much.

There is a need for regular dialogue on the services available through telemedicine. There is a great need among those represented by RAIPON for improved healthcare delivery.

Additional information on the RAIPON can be found at:
**http://www.raipon.org**

## K. Saami Council

***Materials provided by Carl Hild and based on informal conversations.***

Two key issues are mobility and user interface.

The Saami reindeer herders want the ability to access mobile telemedicine units. These units need to have the ability to communicate with local clinics and hospitals from mountainous areas out of regular telephone service areas. The units also need to be durable for travel to remote sites and be able to function over a variety of temperatures.

Instructions on how to use the systems would need to be clear. Common phases and terms, along with a "user friendly" interface, are needed. Because the use of a keyboard may be a barrier, touch screen or voice activation may be desired.

Additional information on the Saami can be found at:
**http://itr.se/boreale/samieng.htm**

## L. International

The International Medical Informatics Association has been discussing guidelines for telemedicine (see: **http://www.imia.org**).

## M. Antarctic

The Scientific Committee for Antarctic Research (SCAR) is preparing a report due out in July 2000 on the utilization of telemedicine in the Antarctic. Desmond Lugg, a Council member of the International Union for Circumpolar Health and SCAR member for human health issues, has provided several existing reports on the application of telemedicine in the region of the South Pole.

"The time-honored approach…has been for [tele]medical developments to be introduced as communications become more sophisticated."

Key points to consider in telemedicine applications are:

- It is linked to the level of telecommunications
- The health staff must be trained on the system
- Patients and staff need to be aware of the systems benefits
- Equipment must be selected to meet the health delivery needs (Lugg, 1999)

Additional information on the Australian Antarctic Division's activities can be found at:
**http://www.antdiv.gov.au/**

## VIII. Thirty Years of IUCH Telemedicine References

International Union for Circumpolar Health (IUCH) - The following is a listing of presentations on the concept of telemedicine or remote healthcare that incorporates the use of telecommunications from the proceedings of the triennial International Congress for Circumpolar Health (ICCH). Note that for over thirty years there have been discussions on the link between healthcare delivery and the quality of telecommunications in the Arctic. These papers also reinforce the point that pilot studies and trial programs have been supported for many years. Efforts to bring communities into the available communication systems, and to make telemedicine an integral part of daily healthcare delivery, have not had a similar level of support over time. Only recently have telemedicine programs reported being modified for specific northern applications.

### 1967 - Symposium on Circumpolar Health Related Problems, Fairbanks, Alaska, USA

*Archives of Environmental Health - Preventive, Occupational and Aerospace Medicine.* Vol. 17, No. 4. October 1968.

CANADA - Proctor, H.A. The Husbandry of a Northern Health Service. Key note address. Pp 462-463. *(Technology will continue to reduce physical strain imposed by arctic daily life).*

### 1971 - 2nd International Symposium on Circumpolar Health (ISCH), Oulu, Finland

*Acta Socio-Medica Scandinavia.* Supplement 6. Scandinavian University Books, Uleaborg, Finland, 1972.

NORWAY - Oygard, K. Health Service for Sparsely Populated Areas, pp. 38-42.

SWEDEN - Henriksson, J. Delivery of Medical Care to Isolated Communities, pp. 43-46.

NORWAY - Sandmo, S. Delivery of Medical Service to Isolated Communities, pp. 47-49.

SWEDEN - Haraldson, S. Health Services Among Scattered Populations, pp. 50-55.

CANADA - Butler, G.C. Delivery of Health Care in Northern Canada, pp. 56-70. *(Mentions problems related to radio communications associated with the aurora borealis)*

USA - Lee, J.F. The Challenges of Delivering Health Services to Rural Alaska Natives, pp. 71-93. *(There will be regular audiovisual links via satellite available in the next few years)*

**1974 - 3rd ISCH, Yellowknife, NWT, Canada**

Circumpolar Health Editors: R.J. Shephard and S. Itoh, University of Toronto Press, Toronto, Canada, 1976.

SWEDEN - Haraldson, S.S.R. Evaluation of Alaskan Native Health Service: Alternative Approaches to Meeting Basic Health Needs, pp. 559-563.

USA - Armbrust, J.M. The Impact of Two-way Audiovideo Satellite Communication and a Computerized Health Records System on the Management of a Rural Arctic Health Program, pp. 581-583. *(Use of a NASA ATS-1 Satellite for telemedicine for central Alaska and linked to a primary facility in Anchorage, Alaska)*

CANADA - Ferrari, H.E. The Outpost Nurse: Role and Activities in Northern Canada, pp. 600-604.

**1981 - 5th ISCH, Copenhagen, Denmark**

Circumpolar Health 81 Editors: B. Harvald & J.P. Hart Hansen. *Nordic Council for Arctic Medical Research,* Report Series 33*.* Oulu, Finland, 1982.

SWEDEN - Haraldson, S.S.R. The Total Man in His Total Environment, pp. 5-6.

U.K. - Dove, G., R. Clubb, R. Lucas, P. Norris, & H. de Wardener. Now Say "Ah" to the Computer, pp. 22-23. *(Computer based health interviewing)*

USA - Stillner, V. Mental Health Services in Alaska: Past, Present, Future, pp. 66-68.

CANADA - House, A.M., J.M Roberts & E.M. Canning. Telemedicine in Northern Health Care, pp. 88-90.

**1984 - 6th ISCH, Anchorage, Alaska, USA**

Circumpolar Health 84 Edited by R. Fortuine. University of Washington Press, Seattle, WA, USA, 1985.

SWEDEN - Haraldson, S.S.R. What Do We Expect From Front-line Health Services for Adversely Situated Populations? Pp. 17-21.

CANADA - Horne, J. An Economic Perspective on Teleradiology for Remote Communities, pp. 390-393.

CANADA - Sarsfield, P. Two Remote Canadian Medical Practices, pp. 406-409.

## 1987 - 7th International Congress on Circumpolar Health (ICCH), Umea, Sweden

Circumpolar Health 87 Editors: H. Linerholm, C. Backman, N. Broadbent & I. Joelsson. *Arctic Medical Research,* vol. 47: Supplement 1, 1988.

USA - Caldera, D.L. Supervision of Primary Health Care Workers in Alaska - One Approach, pp. 357-359.

AUSTRALIA - Lugg, D.J. Antarctica - Lessons for Health Care Planning and Delivery to Circumpolar Populations, pp. 360-364.

USA - Johnson, M.S. Emergency Medical Services Communications Planning in Alaska, pp. 394-397.

## 1990 - 8th ICCH, Whitehorse, Yukon, Canada

Circumpolar Health 90 Editors: B.D. Postl, P. Gilbert, J. Goodwill, M.E.K. Moffatt, J.D. O'Neil, P.A. Sarsfield, & T.K. Young. University of Manitoba Press, Winnipeg, Manitoba, Canada as well as *Arctic Medical Research,* vol.50: Supplement 5, 1991.

USA - Caldera, D. & G. Anasogak. The Importance of a Functional Communication System in the Provision of Health Care in Rural Alaska, pp. 73-75.

CANADA & USA - Wheatley, B., B. Brunk, Y. Chase, & E. Lalley. The Canadian-Alaska Health Agreement - A Practical Approach to Developing Cross Border Links, pp. 114-116.

RUSSIA & USA - Mala, T.A., A. Lebedev, A. Aldraliyev & M. Munson. A New Medical Agreement for the Soviet Far East, Alaska, Magadan, Chukotka, pp. 117 - 118.

RUSSIA & CANADA - Alekseeva, N.V. Siberia - Canada: Joint Research on Circumpolar Health, pp. 130-131. *(Exchanged EKGs were read to compare results)*

USA - Pflaum, J., K. Morris, D. Young, N. Sanders, B, Predeger & S. Littell. Providing Baccalaureate Nursing Education to Remote Populations via Telecommunications: Problems and Solutions, pp. 143-144.

CANADA - Thomlinson, E., D. Gregory & J. Larsen. A Northern Bachelor of Nursing Program: One Solution to Problems in Health Care Provision, pp. 145-148.

CANADA - Allen, I. Community Health Representatives Working in Labrador Inuit Communities, pp. 151-152.

USA - Larson, K. The Evolution of a Village-Based Health Education Project, pp.153-156.

USA - Caldera, D., S. Daniels & W. Ashenfelter. The Role of the Community Health Aide in Rural Alaska, pp. 157-160.

USA - Caldera, D.L. Community Health Aide Program: Health Care for Rural Alaska Natives by Rural Alaska Natives, pp. 166-169.

CANADA - Keeper, C. Barriers to Health Careers in British Columbia: Problems and Solutions, pp. 201-204.

CANADA - Ward, J.A. Developing Community Mental Health Services for Indigenous People of Northern Ontario, pp. 256-260.

**1993 - 9th ICCH, Reykjavik, Iceland**

Circumpolar Health 93 Editors: G. Petursdottir, S.B. Sigurosson, M.M. Karlsson, J. Axelsson. *Arctic Medical Research,* vol. 53: Supplement 2, 1994.

U.K. - Maclean, J.R. The Development of Telemedicine Systems Using Remote Antarctic Sites as a Space Analogue, pp. 98-101.

CANADA - Perkine, J., S. Berry & J. Tryssenaar. The Northern Studies Stream: Educating Health Professional in Remote Regions, pp. 118-120.

USA - Templine, D.W. & G. Boyer. The Computerized PCC System of the Indian Health and its Use in Research, pp. 133-134.

USA - Thomas, N. History of Educational Telecommunications in Alaska: An Application of Diffusion of Innovations Theory, pp. 139-144.

**1996 - 10th ICCH, Anchorage, Alaska, USA**

Circumpolar Health 96 Editors: R. Fortuine, G.C. Conway, C.D.Schraer, M.J. Dimino, C.M. Hild, & J. Braund-Allen. *International Journal of Circumpolar Health*, vol. 57, Supplement 1, 1998. *(There was also a special Telemedicine session within this Congress as a full day, hands-on demonstration.)*

AUSTRALIA - Lugg, D.J. Telemedicine: Have Technology Advances Improved Health Care to Remote Antarctic Populations? Pp. 682-685.

GREENLAND - Steele, R.E. Telemedicine in Greenland: The Case for and against Implementation, pp. 686-688.

USA - Beck, R.D., C. Saddler & R, Ranch. Preliminary Experience with an Orthopedic Teleradiology service at the Alaska Native Medical Center, pp. 689-690.

CANADA - Martin, B.D., C. Levi & J.L. Kelly. Enhancing Diagnostic Ultrasound Programs Utilizing Wide-Area Image Management Technology. Pp 691-693.

USA - Pickard, J.A. Instrumentation Available for Remote Diagnosis and Consultation in Eye Care, pp. 694-696.

**2000 - 11th ICCH, Harstad, Norway**

A "Special Symposium on Telemedicine and Health Care Delivery in Remote and Rural Regions" consisted of two full sessions and a demonstration of the latest technology in telemedicine.

USA - Ferguson, S.A. & L.M. Lekness. The AFHCAN Project: Linking 235 Federal and State Healthcare Sites in Alaska.

USA - Hild, C.M. The Arctic Telemedicine Project: An Eight-nation Arctic Council Sustainable Development Program.

USA - Baldwin, M. & Y. Stevenson. A Model for Providing Prenatal Health Care Services to Indigenous People Living in Remote Locations.

GREENLAND - Karlsen, K.O. Tailoring Telemedicine to Meet the Needs of the Population of Greenland.

CANADA - Katt, M. Facilitating the Continuity of Care for First Nation Clients within a Regional Context.

CANADA - Jong, M.K.K., L. Horth-Susin & K. Horwood. Tips on Setting Up Telehealth in Remote Communities.

CANADA - Jong, M.K.K. Effective Telehealth for Remote Communities.

CANADA - Minore, B., D. Vergidis & M.E. Hill. Knowledgeable, Consistent, Competent Care: Meeting the Challenges of Delivering Quality Cancer Care in Remote Northern Communities.

RUSSIA & NORWAY - Kozlov, V.D. & T. Sorensen. Feasible Telemedicine Technologies: Experiences from Arkhangelsk, Russia.

CANADA - Labadie, W. Satellite Communications and Telemedicine in Nunavik: Improving the Accessibility to Quality Health Care in Isolated Regions.

GREENLAND/DENMARK - Stensgaard, T. Telemedicine in Greenland, a Business Plan for the years 1999-2002.

NORWAY - Christensen, T. Health Information via Telecommunication in Primary Health Care in North Norway.

**In addition, the following papers likely contain materials that relate to telemedicine.**

USA - Fisher, D.G., F.W. Pearce & D.J. Statz. Health Care Provider Retention in Alaska.

USA - Gunlik, J. & V. Bell. Effectiveness of the Otitis Media Program of the Yukon-Kuskokwim Health Corporation in Bethel, Alaska.

USA - Nicholi, E. & C. Odinzoff. Emergent Care and Transport on the Yukon-Kuskokwim Delta.

USA - Norgaard, A. & M. Ramesh. A Bilingual Preventative Health CD-ROM for Children in Rural Alaska.

USA - Mark, C. & H. Kvamme. Computer training for Community Health Practitioners in Rural Alaska.

CANADA - Egan, C. Research for All: The Role of Northern Nurses.

CANADA - Schroeder, K., K.M. Kowalke & G.G. Yelland. Implementing a Pharmacy-based Antibiotic Surveillance Program for Central Subarctic Canadian Nursing Stations.
CANADA - Haggarty, J., J. Craven, P. Kermenn & Z. Cernovsky. Health and Well-being in Nunavut: CD-ROM Suicide Education in the Arctic.

NORWAY/RUSSIA - Hald, M.P. & G. Rezvyj. Open Talks Between East and West; Co-education in Archangelsk, Russia.

## IX. Other Circumpolar Telemedicine Citations

Hudson, H. & E.B. Parker (1973). Medical Communication in Alaska by Satellite. *New England Journal of Medicine*, vol. 289, no. 25 (December 20th issue), pp. 1351-1356.

Hudson, H & T.S. Pittman (1999). From Northern Village to Global Village: Rural Communications in Alaska. *Pacific Telecommunications Review*, vol. 21, no. 2, 4th Quarter 1999, pp. 23-34.

Lugg, D.J. (1974). Facsimile transmission from Antarctica as an aid to diagnosis and treatment. *Med. J. Aust*, 1, pp. 472-474.

Lugg, D.J. (1998). Telemedicine: have technology advances improved health care to remote Antarctic populations? *96 Circumpolar Health International Journal of Circumpolar Health*, vol. 57, supplement 1, pp. 682-685.

Lugg, D.J. (1999). Telemedicine: the cornerstone of Australian Antarctic medical practice. Proceedings of the 7th National Informatics Conference, Hobart, Tasmania, Australia.

Sullivan, P. & D.J. Lugg (1995). Telemedicine Between Australia and Antarctica: 1911-1995. SAE Technical Paper Series #951616, Warrendale, PA.

# Appendix A

## Key Contacts and Resource Personnel

## Key Contacts and Resource Personnel

Each of the Senior Arctic Officials and Permanent Participant representatives to the Arctic Council were requested to appoint a person who could provide the latest telemedicine information for the development of this report. The Key Contact for each nation and Permanent Participant group is listed with information on how they may be reached. In addition, those individuals who were in attendance at the Arctic Telemedicine Workshop on 6-7 March 2000 are listed and noted with an asterisk (*). Also listed are current resource personnel who were identified by the key contacts as knowledgeable and involved in telemedicine.

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