



Project

“Telemedicine in North-West Russia”

Final report

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DESCRIPTION

1.1. Background

Initial discussions of collaboration in telemedicine began as early as 1992-93, just after the Iron Curtain had collapsed and the borders between East and West were reopened after 70 years. The newly proclaimed Barents Region encouraged collaboration in many fields, and health was one of the most important areas. In the course of several friendship and “getting-to-know-you” visits to Russia by staff from Troms County Council and the University Hospital of Tromsø (UHT), health bureaucrats, politicians, and health care workers agreed that telemedicine was an area in which they wished to collaborate. Many joint projects were started between UHT and health institutions in Arkhangelsk. A distance learning program for Russian and Norwegian nurses that provided a way of continuing to work together beyond the physical meeting venues was one of these early projects.

In 1997, the National Centre of Telemedicine (NCT)¹ received its first funding from the Barents Secretariat for the project “Telemedicine in North-West Russia.” The foundations of the project had, however, been laid as early as in 1992, when an exchange of information was begun and professional contacts established. We saw the beginning of network-building, small-scale testing of equipment and software, and communication within Arkhangelsk Oblast. Thus, the project “Telemedicine in North-West Russia” got off to a good start.

1.2. Objectives

1.2.1. Overall aim

The overall aim of the project was to develop and strengthen telemedicine collaboration between Arkhangelsk Oblast and Northern Norway.

1.2.2. Goals

The main objective of the project was to examine and improve communication and mutual exchange of information between health care personnel in Norway and Russia and within Arkhangelsk Oblast, in order to:

- Improve access to health care for the population of outlying districts of Arkhangelsk Oblast.
- Contribute to increasing the competence of health care personnel in Arkhangelsk Oblast via improved communication between health care institutions in the oblast.
- Contribute to greater sharing of competence and knowledge between health workers in Arkhangelsk Oblast and Northern Norway.

The project focused on three main areas:

¹ Formerly Department of Telemedicine

1. Establishment of a digital two-way sound and image connection between the regional hospitals in Tromsø and Arkhangelsk that could be used for distance learning, providing professional forums, planning and the like.
2. Study of various options for setting up mobile telemedicine units to be used in areas with poorly developed infrastructure.
3. Expanding and improving the still-image network used for medical consultations within Arkhangelsk Oblast.

1.2.3. Activities²

1. Setting up and running a telemedicine network in Arkhangelsk Oblast.
2. Establishing distance learning programs for Russian and Norwegian health care personnel as a normal service.
3. Setting up a digital two-way sound and image (video conference) connection between Norway and Arkhangelsk.
4. Establishing and testing a mobile telemedicine unit in Arkhangelsk Oblast.
5. Developing a Russian version of the DORIS multimedia medical referral system and adapting it to local conditions in North-West Russia.
6. Carrying out an evaluation of the still-image network in Arkhangelsk Oblast in terms of economic consequences and user satisfaction.

1.3. Partners in Russia

1.3.1. Main partners

- The Health Department of Arkhangelsk Regional Administration
- The Regional Hospital of Arkhangelsk (RHA)
- The Regional Children's Hospital and other regional health care institutions
- Local hospitals and health institutions
- Northern State Medical University

1.3.2. Other partners

In the course of the project period, NCT has been in contact with various organizations, businesses, and individuals who have made technical and organizational contributions. In our final report we would like to thank the following in particular:

- Internet Arkhangelsk Ltd.
- TEMCOM Ltd. (Arkhangelsk)
- Tele Ross Arkhangelsk
- The Optical/Mechanical Equipment Laboratory, St. Petersburg
- Health economist Elena I. Dzedzelava (Arkhangelsk)
- Elena V. Kudrjasjova, Professor of social sciences, Pomor University, Arkhangelsk
- Arkhangelsk Medical College (which provides lower degrees in health care)

² In this report, some aspects that were treated separately in the original project proposal are combined.

1.4. Organization

1.4.1. Internal organization

The project has been directed by the NCT management and the UHT administration. The project was organized according to the matrix principle: people employed in other fields at NCT have been involved in the project as experts and advisors in their particular specialties. Various types of health personnel at UHT – nurses, bioengineers, occupational therapists, doctors, and pharmacists – have played active roles in the project, mainly in relation to the distance learning program. Academic staff of the University of Tromsø and Tromsø University College have also contributed to the lectures, as have health personnel from Tromsø Municipality.

1.4.2. External organization

The project was organized as a joint venture between the two countries, and responsibilities and authority were divided along clear lines. Formally, this division was part of the partnership agreement which was signed on 27 February 1997. Special agreements have been drawn up for the larger parts of the project, such as the placement of equipment and agreements on evaluation. Otherwise, the division of responsibilities and authority have been established during working meetings between the parties.

The table below shows the division of responsibilities and authority between the two parties to the project in Arkhangelsk and Norway.

	Responsibilities	Authority
Norway	<ul style="list-style-type: none"> • delivering/purchasing/borrowing additional equipment for the network: PCMCIA card, modem, lens, and camera • purchasing equipment for the video conference link and mobile telemedicine unit • providing knowledge and expertise for all project activities 	<ul style="list-style-type: none"> • selection of other collaborators and signing necessary contracts with Russian organizations and specialists • approving plans and changes during the project period
Russia	<ul style="list-style-type: none"> • purchasing computers for an oblast network • installing the equipment • training personnel • renting and running premises for TM network in the oblast • paying personnel involved in the project • documenting the results of remote consultations and distance learning programs 	<ul style="list-style-type: none"> • selecting suitable districts and important activities • running still-image network • running video conference equipment • carry out remote consultations in accordance with Russian law and health care authority regulations • testing equipment and software • evaluating introduction of telemedicine services in Arkhangelsk Oblast

Table 1. Division of responsibilities/authority in the project between Norway and Russia

1.5. Professional background

A high degree of professional expertise on both Russian and Norwegian sides has been of fundamental importance for the implementation of the project. Without in-depth knowledge of the organization of health care services, technical competence and local knowledge, it would not have been possible to conduct such an extensive interdisciplinary project.

Both nationally and internationally, NCT is at the leading edge in the field of research on and development of telemedicine and telemedicine services. UHT has had many joint projects with health institutions in North-West Russia. Through these projects, the hospital has acquired a better knowledge of the health sector and the professional qualifications of health care personnel in Arkhangelsk Oblast. This expertise has proved useful for the implementation of the project in general, and for the distance learning program in particular.

Our Russian partners have participated in meetings at NCT and in Arkhangelsk. These meetings were used to work out the details of technical specifications and training programs. In addition to other activities, training was given in the use of video conference equipment, DORIS, and the mobile unit equipment. We have also seen it as important that project participants take part in seminars and conferences in Russia and other countries in order to broaden their knowledge and expertise in telemedicine.

1.6. Timescale

A timescale was created for the implementation of the project. Detailed schedules are described in the individual applications. During the course of the project, the schedule was continually revised in accordance with the situation in Russia and other external causes. Changes in the schedule have been reported to the funding authorities on a regular basis.

Establishing a telemedicine network in Arkhangelsk Oblast:

A network consisting of six districts and headquarters at the Regional Hospital of Arkhangelsk (RHA).

- Purchasing and siting of equipment, 1998
- Testing, 1998
- System in operation from 1 January 1999 and for the remainder of the project period

Distance learning for Russian and Norwegian health care personnel:

- Throughout the project period
- Still-image-based distance learning using a telephone with built-in loudspeaker, 1996-1999
- Distance learning by video conference link, 1999 to present

Setting up a digital two-way sound-image (video conference) link between Norway and Arkhangelsk:

- Evaluation of technical requirements, 1998
- Testing line and equipment, 1998
- Purchasing and installing video conference unit, 1998
- Establishing video conference link Tromsø-Arkhangelsk, 1999

Mobile telemedicine unit in Arkhangelsk Oblast:

- Evaluation of technical requirements for mobile telemedicine units, 1999
- Purchasing components for mobile telemedicine unit, 1999
- Test period, 1999-2000
- Mobile unit version 2.0 developed in 2000
- Evaluation and comparison of mobile units, 1999-2001.

Russian version of DORIS software and adaptation to local conditions in North-West Russia:

- Adapting and testing telemedicine via the Internet, 1999
- Installing and adapting equipment for DORIS, 1999
- Course in DORIS, 1999 and 2000
- Testing newer versions of DORIS, 1999-2001

Evaluating the still-image network in Arkhangelsk Oblast:

- Evaluation completed, 1999
- Report written and presented at conferences, 2000

1.7. Funding from INTER-REG and other sources

The table below shows the funding the project has received in the period 1997–2000:

Year	Source	Amount
1997	Barents Secretariat	300,000
1998	Barents Secretariat	800,000 of which: 300,000 in 1998 500,000 in 1999
1999	Inter-Reg IIA	657,000
2001	Inter-Reg IIA	1 023,185
1998	Troms County Council, Dept. for Planning and Industry	150,000
1999	University of Tromsø	100,000
2000	University of Tromsø	150,000

Table 2. Project funding, 1997-2000

The Barents Secretariat awarded an additional 440,000 for the project “Continuation of Telemedicine in North-West Russia,” and a substantial part of this amount has been used on the pilot project ”Network for Tuberculosis Prevention in Arkhangelsk Oblast” and ”Distance Learning Internally in Arkhangelsk Oblast.” These are new projects and activities, not covered by the funding listed above. We will report on these activities when they have been completed towards the end of 2001.

1.8. Results

With reference to the project proposal, we expected the following results:

- New telemedicine stations would be up and running at local hospitals in Arkhangelsk Oblast.
- The number of telemedicine consultations in North-West Russia would increase.
- A report on the financial consequences of using telemedicine in North-West Russia would be completed.
- A report on user satisfaction with the introduction of the still-image network in Arkhangelsk Oblast would be completed.
- A video conference link would be set up between Tromsø and Arkhangelsk.
- We would have documentation on the use of mobile telemedicine units in regions with poorly developed infrastructure.
- Medical and technical expertise would have increased in both Norway and Russia.
- Communication between Northern Norway and North-West Russia would increase and intensify.
- We would have documentation of the scope for using the internet for telemedicine applications.
- The Russian version of the still-image system DORIS would be tested and ready for use.

II. EVALUATION

2.1. Implementation

The implementation of the project has largely been as expected. Some activities were delayed due to financial difficulties in Russia (particularly in August 1999), problems in providing the equipment necessary, an over-ambitious schedule, and at times, due to lack of human resources in both Russia and Norway. Nevertheless, the project activities were successfully carried out, not least thanks to the goodwill of the health authorities and the enormous contributions of the health personnel at the health institutions involved in Arkhangelsk Oblast.

The implementation and results of the projects have been presented in articles and at conferences in several countries. Detailed annual reports have been written, and these have been distributed to the funding agencies and other interested parties.³

2.1.1. Telemedicine network in Arkhangelsk Oblast⁴

The still-image network ceased to be a project activity on 31 December 1998. The scheduled telemedicine units were then in place at six local hospitals in the region. This part of the project has attracted considerable attention in Russia, Norway and the rest of the world because it uses telemedicine *in practice*, and – taking account of local conditions – on a relatively large scale. NCT would therefore like to continue to follow the development in order to develop the concept further, and expand it into other medical fields, such as prevention and control of TB.⁵ Continued attention is also necessary if it is to be possible to apply the expertise gained in other parts of the world. In fact, the still-image network is the foundation of all telemedicine activities in North-West Russia. Registration, evaluation, and development of the network is therefore still going on.

Since 1999, several districts not included in the project have received their own telemedicine workstations. These have been established thanks to the Russian Public Health Ministry and other joint projects such as the TACIS-funded project between Arkhangelsk and Western Norrland in Sweden. As of June 2001, 13 stations are operative at local hospitals and in the primary health sector. We expect more workstations to be set up in Arkhangelsk Oblast in the near future. All stations have had the latest version of DORIS installed.

Table 3 summarizes important information about the still-image network in Arkhangelsk.

³ Documentation of the project can be found at www.telemed.no *(Norwegian only)

⁴ This part of the project is described in a separate report.

⁵ In the year 2000, a related project was started up in collaboration with the Regional Tuberculosis Hospital, the Norwegian Heart and Lung Association and the National Institute of Public Health in Norway.

Location	Station established	Number of inhabitants	Distance from Arkhangelsk (km)	Consultations carried out from establishment to 31.12.2000
Town Hospital, Kotlas	03.96.	110 000	650	148
Town Hospital, Korjazma	02.98.	40 000	700	30
Central District Hospital, Velsk	01.97.	40 000	500	33
Central District Hospital, Njandoma	05.98.	40 000	450	23
Children's City Hospital, Severodvinsk	05.98.	245 000	50	34
Central District Hospital, Onega	12.98.	45 000	400	24

Table 3. Establishment and running of network in Arkhangelsk Oblast

2.1.2. Distance learning for Russian and Norwegian health personnel⁶

Competence development and distance learning between the regional hospitals in Arkhangelsk and Tromsø have been very important parts of the project. Distance learning has been a regular feature since 1996. 1999 was an important year for the distance learning program, because we made the transition from using the VIDA still-image system and loud-speaker telephones, to direct transmission of sound and image (video conferencing). This has increased activity and also the need for training lecturers. See also section 2.1.3.

Supplying distance learning activities to Russia has gradually become a regular part of the distance learning program at UHT.⁷ Tables 4 and 5 show the number of transmissions and participants from 1996 to May 2001.

	1996	1997	1998	1999	2000	2001 through 05.01	Total
From Norway to Russia	5	6	13	15	16	12	67
From Russia to Norway	1	1	4	5	5	2	16
Total	6	7	17	20	21	14	83

Table 4. Number of transmissions between Tromsø and Arkhangelsk in the period 1996 – 05.2001

⁶ This part of the project is described in a separate report.

⁷ Cf. Catalogue for distance learning program at www.telemed.no

	1996	1997	1998	1999	2000	2001	Total
In Arkhangelsk	120	131	183	416	627	200	1677
In Tromsø	52	45	104	75	87	19	382

Table 5. Number of participants in distance learning programs 1996 – 05.2001

During 1999, the distance learning program was expanded to also include other health institutions in the oblast. A small "telephone exchange" was purchased, which makes it possible to extend distance learning to local hospitals connected to the telemedicine network. In addition to distance learning, the "exchange" can also be used for diagnostic work, so that several specialists can discuss a difficult case.

Distance learning is part of a larger joint project at UHT between Russian and Norwegian nurses, which also comprises in-hospital training and various professional events. Some of the literature (booklets, compendiums) used in preparing distance learning sessions has been translated into Russian and sent to many hospitals in Arkhangelsk. The lectures themselves have also been collected in compendiums and sent to Russia. The compendiums are used on various occasions, such as when receiving visitors from Russia.

An evaluation form has been prepared for participants and lecturers in order to document technical problems and the professional value of the teaching. The form provided us with valuable information for our work in developing the distance learning program further.

2.1.3. Setting up a video conference link between Tromsø and Arkhangelsk

Since 1996, distance learning between Tromsø and Arkhangelsk has taken place by means of still images on computers and loud-speaker telephones. As a result of joint funding initiatives within the Barents Region, a combined ISDN and satellite connection to Arkhangelsk was set up in April 1999.

This part of the project is described in a separate report.

2.1.4. Mobile telemedicine unit

Distances are great in Arkhangelsk Oblast and the out-lying districts are sparsely populated. The Regional Hospital (RHA) is responsible for co-ordinating emergency services and running air ambulance flights to all areas in the oblast, apart from the large cities. The health authorities and RHA wanted a mobile telemedicine unit which could be used for emergency medicine and screening, so as to save specialist time and travel expenses for both the hospital and patients. The "Mobile Telemedicine Unit" project was started in September 1998.

The unit was ready in April 2000 and was tested in Mezen. The unit consisted of ECG equipment, an endoscope, and a digital camera. The camera was originally intended to be used for radiology, but can also be used for other medical examinations, such as taking pictures of skin, wounds and samples.

During the first test period, 46 patient consultations were carried out, of which 18 were emergencies and 28 screenings. The test period showed that some of the equipment was inadequate for the purpose, and the unit was therefore upgraded with a new computer, new ECG equipment, and a new camera. The unit was also equipped with the latest version of the DORIS multi-media system.

Since the testing of mobile unit version 2.0 began, over 1000 examinations have been carried out, of which 200 have been emergencies and the rest screenings. With regard to screenings, there is a desire to expand the mobile unit to include a mobile ultrasonograph and pulse oximeter. EEG equipment would also be desirable.

On the Norwegian side, NCT has obtained very good medical and technical results in a short time. Had the project been carried out in Norway, it would have taken several years to collect the same amount of patient material. The experience gained has also been important for NCT as regards aim of being recognized as a Collaborating Centre by the World Health Organization (WHO). The project has attracted attention and interest from the medical community in Moscow, and in other countries, including the USA, Nepal and Kyrgystan. Enclosed is a report which contains the statistics from the Unit I test period in 2000 and Unit II in 2001. The overall experience of using the mobile telemedicine units will be summarized in an article in an international journal in late 2001.

2.1.5. Russian version of DORIS software

In 1999, work began on a Russian version of DORIS. After Well Diagnostics took over all rights to DORIS the same year, NCT has signed an agreement concerning the purchase of licenses and user support. This part of the project has therefore been carried out in close association with Well Diagnostics. Two workshops were organized in Arkhangelsk, in which everybody working with telemedicine in the oblast took part. The participants were taught to use DORIS and were given the opportunity to test this version during remote consultations. The Norwegian company received both positive and negative feedback which has contributed toward developing the software further.

In the autumn of 2000, Well Diagnostics opened a sales office in Arkhangelsk. This would not have been possible without the support of the project.

2.1.6. Evaluation of the still-image network in Arkhangelsk Oblast

In the course of 1997, routines were developed for documenting telemedicine activities in Arkhangelsk Oblast and activities between Arkhangelsk and Tromsø. Since then, all still-

image transmissions have been registered, and annual and biannual activity reports have been prepared. The latter half of 1998 also saw the beginning of a larger evaluation of telemedicine in Arkhangelsk. Two evaluation studies have been completed. One is an economic analysis, conducted by health economist Trine S. Bergmo of NCT and Elena I. Dzedzelava, an economist from Arkhangelsk. The two have studied the cost-efficiency effect of remote diagnostics using the still-image network as compared with traditional methods, i.e., transportation of either the patient or the specialist. The other evaluation study has been carried out by Hilde Rotvold, a sociologist at NCT, and Prof. Dr. Elena V. Kudrjasjova of Pomor State University, Arkhangelsk. This study is focused specifically on the use of telemedicine services and the organization of telemedicine in Arkhangelsk. Both studies are presented in separate reports.

These studies fulfil two important objectives of the project: (i) to document the effects of the introduction of telemedicine in North-West Russia, and (ii) to expand and increase contact between Russia and Norway, and between different professions and disciplines. This collaboration has been fruitful and useful for both parties, in spite of different research traditions, great distances, language problems, and other well-known “Barents syndromes.”

2.2. Results

The major objectives of the project have been achieved. All scheduled activities have been carried out, although some have been combined.⁸ Taking part in the project has given participants useful insights into several other areas beyond telemedicine. Health personnel in Norway and Russia have increased their expertise in health care, technology, organization, and financial management.

2.2.1. Norway

- In Norway, the project has had considerable positive effects beyond the specific results of particular activities:
 - i. First of all, the project has contributed to increasing NCT’s expertise in still-image-based telemedicine services in general, and mobile telemedicine units in particular.
 - ii. Experience gained on the project has definitely increased NCT’s chances of becoming a “WHO Collaborating Centre on Telemedicine.”
 - iii. The newly established, Troms-based company Well Diagnostics, has been able to set up in Russia.

⁸ See section 2.3 for more detailed results of individual activities.

- iv. UHT health care personnel have become more proficient in distance learning and ICT in general through their use of computers, PowerPoint and video conferencing equipment.
 - v. The project has contributed to strengthening other joint projects and activities in the Barents Region, especially through the video conference link. An example is the collaboration in psychiatry which was planned several years ago.
- The project has fostered ideas for other joint projects between Norway and Russia in several areas, e.g., pathology.
 - “Telemedicine in North-West Russia” has contributed substantially to other projects and provided valuable competence in the field of telemedicine in Arctic areas. This was expressed, for instance, in the Arctic Telemedicine Project funded by Arctic Council (<http://arctic-council.usgs.gov/>).
 - The project has also supported educational projects involving the University of Tromsø and colleges in Northern Norway and Pomor University in Arkhangelsk.

2.2.2. Russia

The project has also had positive effects in Russia:

- A telemedicine centre has been established at the Regional Hospital of Arkhangelsk, which is closely linked with the Centre for Disaster Medicine and Air Ambulance Services.
- Telemedicine has become part of the ordinary budget of the Health Administration in Arkhangelsk.
- The Russian Public Health Ministry has, as a direct consequence of the project, contributed to other telemedicine stations in Arkhangelsk and other parts of North-West Russia.
- Health personnel involved in distance learning programs have increased their ICT competence and learned a lot about using computers, PowerPoint and video conference equipment.
- The infrastructure in North-West Russia has been considerably improved in recent years, and this is partly due to the demands of telemedicine.

2.2.3. Publications and information about the project

The results of the project have been thoroughly documented in various media: TV, newspapers, journals, reports, internet publications, brochures, and last but not least, at conferences. Below is a year-by-year list of publications and information about the project.

1998

- A brochure was issued in Russian about telemedicine in Norway and collaboration between Tromsø and Arkhangelsk.
- When full funding was awarded to the video conference link between Tromsø and Arkhangelsk, TV-Tromsø ran a story on the project (April 1998).
- Project memo about North-West Russia: “Telemedicine in Northwest Russia II,” NCT.

1999

- Survey article on telemedicine collaboration between Tromsø and Arkhangelsk, “Telemedicine in Northwest Russia” by T. Sørensen, A Rundhovde, and V. Kozlov, published in the *Journal of Telemedicine and Telecare*, 1999.
- On the opening of the video conference link between Tromsø and Arkhangelsk, TV-Tromsø ran a story about the project (May 1999). There were also items in the local newspapers, *Nordlys* and *Tromsø*.
- Project memo on “Telemedicine in Northwest Russia” up-dated.
- Report on evaluation studies.

2000

- S. Manankova Bye and T. Sørensen: “The Russia Project: Annual Report 1999”, NCT Report, March 2000, published on the Internet.
- S. Manankova Bye: “Experiences with Distance Learning Programs across Borders” (Russian), “Information Society” Nr. 1 –2000.
- E. Kudrjasjova and G.H. Rotvold: “A sociological evaluation of Telemedicine in North-west Russia,” NCT Report, March 2000.
- Dzedzelava E, Bergmo T: “An economic evaluation of telemedicine in North-west Russia”, NST-report March 2000.
- Information, descriptions, and some results of the project are available on the Internet in Norwegian and Russian.
 - www.telemed.no
 - www.okb.msa.ru
 - www.msa.ru
- Article in the journal of the Ministry of Health and Social Affairs.

2001

- TV report on Finnish television (March, 2001).
- TV report on Russian television (March, 2001).
- Brochure: “Arkhangelsk Area. Telemedicine XXIst century” in English and Russian, on CD-rom and paper.
- “Bringing Arkhangelsk to the World”: information on paper about video conferencing communication established with Arkhangelsk, in Norwegian, English, and Russian.
- “The Video Conference Guide, 2001.” Brochure in Russian created in collaboration with “Net-based Education”.

2.2.4. Conferences, meetings, study trip

The project has been presented on numerous occasions, both nationally and internationally, and has attracted considerable attention because of the simple solutions chosen, and because of good Norwegian-Russian cooperative relations, which have functioned over several years. The project was presented at:

- NCT's "Telemedicine Training Course" (April 1997 and April 1998);
- "WHO/UHT International Telemedicine Training Course" (November 1998);
- The annual Norwegian telemedicine conference, "Norwegian Telemed 99" (October, 1999),

and also in connection with visits by people from Norway and abroad. Our Russian partners seize any opportunity they get to provide information about telemedicine in North-West Russia:

- In August 1999, a joint project trip was arranged to three local hospitals in Arkhangelsk Oblast. Six project participants from NCT and five based in Arkhangelsk visited half of the district stations. The purpose of the trip was on the one hand planning and evaluation of the project so far, and on the other hand to give participants a chance to familiarize themselves with conditions at the local telemedicine units in Arkhangelsk.

16 Norwegian-Russian project meetings have been held during the project period. The project participants have also had project meetings by video conference and whenever possible in relation with conferences, workshops, etc.

Below is a list of the most important conferences at which the project has been presented in papers and demonstrations:

1998

- The "Norwegian Days" event, Arkhangelsk.
- International Symposium "Telemedicine 1998," Turkey.
- Space Biology and Aerospace Medicine, Moscow.
- International Medical Care Networks, Gotland, Sweden.
- 2nd Nordic Telemedicine Conference, Reykjavik, Island.
- Euro-Asia Online 1998, Almaty, Kazakhstan.
- NTCA-World Bank First International Conference on Rural Communications: "There are No Boundaries," Washington DC, USA.

1999:

- International Symposium on "Information Data Base in Medicine 99" in Hurgada, Egypt.
- "4th International Conference on the Medical Aspects of Telemedicine," Israel.
- Norwegian Telemed 99, Tromsø.
- NATO workshop "Networking Infrastructure for the North-West of Russia," Petrozavodsk, Karelia.

- Sub-Regional Seminar on Telemedicine for CIS and Baltic States, Moscow, Russia.
- 2000
- Conference on IT in the Russian Regions, Jaroslavl, Russia.
 - IV Nordic Congress on Telemedicine, Copenhagen, Denmark.
 - ICCH 11 Millennium Congress, Harstad, Norway.
 - International conference on contemporary aspects of telemedicine, Moscow, Russia.
 - International conference on “Telemedicine and Problems of Data Transfer,” Moscow, Russia.

2001

- International telemedicine school, Moscow, Russia.
- International scientific-practical conference on the Russian-Norwegian project “Telemedicine in Northwest Russia.” (Experiences and results of the cooperation between the Norwegian Centre for Telemedicine in Tromsø and the Arkhangelsk region), Arkhangelsk, 22-24 May.

The project will be presented at:

- TELEMATICA-2001 – International Conference on Telematics and Web-Based Education, St. Petersburg, Russia, 17-21 June.
- 6th International Conference on the Medical Aspects of Telemedicine, Uppsala, Sweden, 17-22 June.
- The Barents Conference, Melbu, Norway, 12-14 June.
- Circumpolar Universities Association Conference, Tromsø, 19-21 August.

Project manager, Svetlana Manankova Bye, has taken part in project manager conferences held by the Barents Secretariat in Alta (1998) and in Svanvik (1999).

2.3. Results compared to the original proposal

The project has generally followed the original plans, but the time frame has been adjusted somewhat. The plans have been revised in collaboration with our Russian partners and after consultation with the funding agencies. How well the project has fulfilled the original objectives was thoroughly discussed and documented at the Final Project Conference in Arkhangelsk, 22-24 May 2001. It is worth mentioning that the project has evolved beyond the original proposals. This is true especially of NCT’s involvement, and is mainly due to the fact that the project has lasted longer than initially intended.

The still-image network. Since new stations with more up-to-date equipment were purchased by other projects and by the Russian Public Health Ministry, the question of standardization of equipment and procedures became more and more pressing. Equipment for various project stations was purchased at different times, and some workstations have been upgraded as new activities were introduced as part of “Telemedicine Network for TB

Prevention in Arkhangelsk.” The question of whether equipment should be upgraded has therefore been a recurring problem. This has in turn meant that this part of the project has taken a long time. The still-image network is the core telemedicine activity in Arkhangelsk, and continued success depends on whether it will continue to function.

Distance learning. The distance learning program between Russia and Norway has now become a normal service. This part of the project has been expanded to also extend distance learning to the telemedicine stations within the oblast. The project has also made it possible for other institutions to provide distance learning.

The video conference link. There has gradually been an increase in interest in using video conference facilities for distance learning activities and as a supplement to more “traditional” forms of collaboration, such as ordinary meetings, travel, etc. However, it took longer than we had imagined to establish the video conference link once funding had been arranged. This was primarily due to the lack of basic infrastructure in North-West Russia, but also to the lack of providers in the region. There was a monopoly situation, and the connection therefore became much more expensive than the project had envisaged. This has changed since the autumn of 2000, when the project entered into a contract with a new company, TeleRoss. The PR aspect of the video conference link has provided us with yet another challenge. This aspect was greatly underestimated and is still a challenge: the connection is there, but its capacity is still poorly exploited.

The mobile telemedicine unit. According to the original plan, two mobile units were to be developed, one containing a satellite telephone. After closer investigation of costing, particularly the cost of using the satellite telephone, we decided to postpone this part. A limited technical test of the simplest satellite telephones was also conducted, showing that they were not suitable for the transfer of medical data. Instead, two units were developed, the second being an improved version of the first, which during the test period proved to have considerable weaknesses. For instance, the monitor of the portable computer proved not to be of the medical quality required for an endoscopy examination. Likewise, the ECG equipment did not function satisfactorily when storing patient data using Cyrillic fonts.

The use of the mobile unit has been far greater than the expectations of the project team. In addition to emergency medicine, the unit has also been used for screening examinations. Today, both units are used for screening as well as emergencies, both internally at RHA and by the air ambulance service.

Evaluation.

The evaluation studies were carried out according to schedule, but these also came to be much more comprehensive than originally planned. The evaluation reports are available (in Norwegian only) on the NCT’s home page, (www.telemed.no).

2.4. Factors underestimated

The most important points which were underestimated are listed below. These are mainly due to factors beyond the control of the project team, such as the problems in the Russian economy in August 1999. Other things that deserve to be mentioned are:

- Far too many activities were scheduled for a relatively short period. The interest among Norwegian health care personnel for distance learning from Russia has been less than we envisaged.
- The increase in distance learning activities has also increased the need for interpreters. This work has mainly been done by the project manager, but as the work load increased, external interpreters had to be employed.
- Problems in finding a telecommunications company which could provide a 128 kb/s line to Arkhangelsk.
- The long process of making potential users aware of the video conference link.
- The time it took from when the project secured funding until the project participants were in place and had been relieved of their normal duties.

2.5. How could the results have been improved?

The following could have been done differently:

- It would have been an advantage if the project had managed to get more support from key institutions working in the Barents Region, especially in the form of networking and publicity, in order to make the video conference link to Arkhangelsk more widely known. This was particularly true of support in relation to procedures connected with customs and import duties and transportation.
- Activities should not be concentrated to a very short period of time, but should be distributed over a longer period.
- The various activities should have been supported by especially designed journals so that the effects of telemedicine could be scientifically documented.
- The project could have been more closely coordinated with other projects and activities in the Barents Region in order to create synergic effects. This is particularly relevant in the area of telecommunications.

2.6. Taking the project further

This project shows that telemedicine has positive effects which go far beyond the concrete activities of project. The project has been of great importance for cross-border

communication and collaboration between health care personnel. Health personnel on both sides of the border have increased their expertise in ICT. The Norwegian telemedicine community has learned a great deal, because the Russians, due to their creativity and liberal regulations, open the way for a greater service volume than we have achieved in Norway. All in all, NCT has very positive experiences with collaboration on research and development projects with North-West Russia.

The Department of Health and health institutions in Arkhangelsk Oblast have promised that the oblast will remain a “testing range” for new technology, new technical-medical services, equipment, programs, etc., in telemedicine.

It is, however, clear that North-West Russia will be dependent on Norwegian support for many years to come. Our experience of telemedicine collaboration with North-West Russia can be exploited by others. The telemedicine network can be used in specialized areas, such as TB control, and the communication lines can be used for training, planning, and following up joint projects in all areas, not just in the health sector. A concrete example of this is the video conference link to Arkhangelsk. This was a very expensive satellite-based service. One-and-a-half years on, the price has been reduced to a tenth. Still, these are substantial expenses for the Arkhangelsk health sector to cover on its own. However, the link constitutes an important improvement in communications with North-West Russia, and an important service for anyone engaged in collaboration within the Barents Region, whether in business, teaching, research or health.

It is still necessary to carry out some *upgrading and technical improvement of the communications* in the network.

The first cross-border patient counselling was carried out on April 6 2001. An increasing number of institutions and organizations are approaching us with enquiries about using our video conference link with Arkhangelsk. It will thus be necessary to *continue the video conference service and also to change the equipment (the Codec) in Russia*.

In the next few years, mobile telemedicine services will constitute one of the major new development areas in telemedicine. Here, the Arctic areas are of particular interest, because of the great distances involved, poor earth-based communications, and issues concerning indigenous populations. Commercial interests also come into the picture, in relation to the expansion of oil exploration in the Polar regions and the increase in adventure tourism in very isolated, inaccessible areas. After Mobile Unit II had been tested and the test results made available, the idea arose of expanding the unit and/or providing a new unit – a “polyclinic on wheels.” It will be necessary to improve the link (using a satellite telephone) and acquire some portable medical equipment for screening the population in the outlying areas of the oblast and those in need of care in the “wilderness”.

In addition to the need for funding of basic infrastructure and developing the ideas of the project further, we must emphasize the need for more scientific documentation of the effects of telemedicine in North-West Russia. NCT has repeatedly had its applications to the Health Programme in the Barents Region turned down, on the grounds that the effects

of telemedicine are not sufficiently well documented. It would therefore be desirable to continue the 1999 studies, in which a certain number of patients who have been treated by means of telemedicine are monitored over an extended period of time. We also need a more comprehensive evaluation of the subsequent treatment of patients consulted via telemedicine, and the consequences this has had for the patients and the health sector in Arkhangelsk Oblast and in Russia in general. The following are also relevant topics for evaluation:

- Links with and influence on/from other projects.
- Technology, communication and structure.

A complete presentation of the entire project, its results, and both positive and negative aspects of the way the project was conducted might contribute valuable recommendations and form the basis of a “recipe,” which might be a help to anybody in the initial phases of new projects, in Russia and elsewhere.