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Telemedicine in Norway: status and the road ahead

Translation from Norwegian

To the Ministry of Health and Social Affairs

The working party on Telemedicine was appointed by the Ministry of Health and Social Affairs in a letter dated 17 September 1998.

The working party hereby presents its report. The working party is unanimous in its recommendations.

Oslo, 13 January 1999

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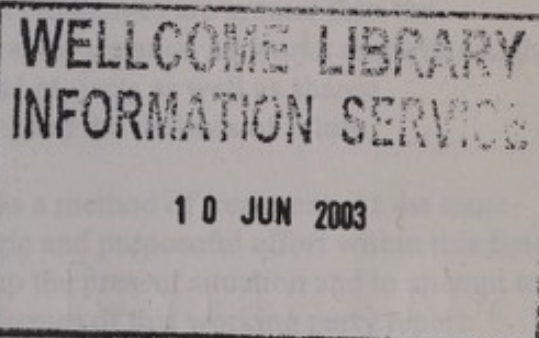
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Chair

Thomas Neby Baardseng

Torleiv Berglan



1 Summary

A group comprising a broad range of representatives of the ministries, the health care regions and the scientific communities has had the mandate of assessing the medical utility of telemedicine. The working party has also done some introductory work on the commercial and regional aspects of telemedicine.

At present there is some level of telemedical activity in all Norwegian health care 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 centre. 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 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.

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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, organisational structure and technology. A comprehensive approach of this kind involving the tight integration of technology, interfaces, organisations and users will be conditional upon the existence of a highly developed and active user environment within the region.

2 The background to the establishment of the working party

At present electronic communication requirements are for the most part met by establishing and organising dedicated communications links for each individual function. This is not efficient in terms of cost or expertise. New technology is now increasingly opening the way for communications requirements to be met by means of common, uniform information networks with integrated services. Quality, security and capacity are keywords in this development. Service integration and high capacity networks are for the present, and viewed in isolation, relatively cost-intensive technologies. Developments in markets and prices and the increasing use by health care regions of communications services suggest that the time is now ripe for a common, service-integrated network for the health care regions to be established. The next stage should be the establishment of a nationwide network. In this context it is important to stress that the organisational challenges are greater than the technological challenges. The efficient use of common information networks requires a high degree of coordination of various needs, measures and projects as well as shared organisational structures. So far we have merely glimpsed the outlines of future developments.

We have relatively little experience of telemedicine as a method of treatment. At the same time this approach offers great potential and a strategic and purposeful effort within this field is called for. It has therefore been necessary to sum up the present situation and to attempt to give recommendations for the future. These are the themes of this working party report.

2.1 The mandate and composition of the working party

The mandate of the working party as formulated in the letter of invitation from the Ministry of Health and Social Affairs dated 17 September 1998 ¹ has been as follows:

"The working party will advise the Ministry in the work on assessing the medical, health-economic and commercial aspects of telemedicine. The following points will be considered by the working party:

- The medical utility of telemedicine within various disciplines.*
- The health-economic and socio-economic aspects of telemedicine with the emphasis on the relationship between telemedical and conventional solutions.*
- When is it efficient to choose telemedicine given both the medical and the health economic assessments?*
- The potential commercial and industrial gains to be derived from increasing investment in telemedicine.*
- The consequences for district policy of increased use of telemedicine.*

It has been important that the composition of the working party be both multi-regional and multi-disciplinary. The working party has therefore been relatively large and comprised the following persons:

Further Health Care Region should function as a step within the operation of related activities within a broad perspective that takes account of positive organizational structure and technology. A comprehensive approach to this kind involving the full participation of technology, institutions, organizations and more will be essential upon the existence of a highly developed and active new environment within the region.

2 The background to the establishment of the working party

All present conditions necessitate consideration as for the most part this is establishing and organizing detailed communication links for each individual function. This is not essential in terms of cost or expertise, but technology is now being developed in the way the organizational environment to be used by users of computer-aided information networks with integrated services. Existing systems and systems are becoming in the development of a more integrated and efficient way of working. The present level of work in relation to the various and different functions and departments is not sufficient to the increasing use of highly sophisticated information systems and the fact that this is now not for a complete system designed and used in the form of a single system to be established. The new system should be the central element of a worldwide network. In this context it is important to stress that the organizational changes are greater than the technological changes. It is not just the organizational structure which is being changed, but the degree of participation of users in the process, as well as their organizational structure. To be a user's system, the user has a certain amount of control. We have actively built experience of network use as a result of research. At the end of this process which gives control and a change and supports it with the fact that is called for. It has been shown that it is not just the organizational structure and the fact that give more control to the users. There are the factors of the working party.

2.1 The mandate and composition of the working party

The mandate of the working party is formulated in the form of invitation from the Ministry of Health and Social Affairs dated 12 September 1987. It has been as follows:
"The working party, established in 1987, is to work on creating the medical, health, economic and communication systems. The following points will be considered by the working party:
• The medical systems, including the use of computers for patient care
• The health services and the use of computers in the hospitals and the region in the relationship between the medical and the health services
• What is the effect on the use of computers in the medical and the health services
• The future development of the medical and the health services
• The requirements for a new system of health care
It has been important that the composition of the working party be both multi-regional and multi-disciplinary. The working party has therefore been established with the following composition:
following persons:

Ernst Isaksen (County Directory of Health in Troms, Northern Health Care Region)
Einar Myklebust (Director of the County Hospital in Molde, Central Norway Health Care Region)
Rune Ingebretsen (IT Manager at the Central Hospital in Rogaland, Western Region)
Terje Blomberg (County politician in Østfold, Region 2)
Peder Olsen (Director of the Central Hospital in Hedmark, Region 1)
Bjørn Engum (The Norwegian Centre for Medical Informatics)
Steinar Pedersen (Telemedical Department, Regional Hospital in Tromsø)
Bård Paulsen (SINTEF (The Foundation for Scientific and Industrial Research at the University of Trondheim)
Finn Henry Hansen (Norwegian Research Council)
Asbjørn Rasch jr. (Norwegian Industrial and Regional Development Fund, Troms)
Björg K. Veisten (The Ministry of Trade and Industry)
Kristin Nakken (The Ministry of Municipal and Regional Affairs)
Ivar Gammelmo (The Ministry of Health and Social Affairs)
Gerd Vandeskog (The Ministry of Health and Social Affairs, Chair).
Thomas Neby Baardseng and Torleiv Bergland, both of the Ministry of Health and Social Affairs have served as the secretaries to the working party. The working party held four meetings: on 16 October in Oslo, on 12 November in Trondheim, on 2-3 December in Tromsø and on 17 December in Stavanger.

2.2 Description of the problem

In its deliberations the working party chose to focus on two dimensions: utility and responsibility for implementation. These choices were made because it is essential that these two aspects be assessed at an early stage. They are fundamental to any further investment in telemedical solutions.

In addition to these two dimensions the mandate includes regional and industrial policy dimensions. The report attempts to focus a critical light on the consequences for district policy of telemedicine. The focus on industrial policy came about as a result of the application from Troms Municipality. This assumes that an investment in a telemedical centre will have industrial and commercial spin-off effects for the local community. Accordingly the working party also assesses the commercial and industrial aspects of telemedicine.

2.2.1 Dimension 1: Utility value

It has been important for the working party to say something specific about the utility of telemedical services. Knowledge of this is essential in order to be able to assess whether telemedical services should be incorporated in the routine operations of the health service. However, the utility concept can be applied to a number of factors. It has therefore been necessary to define what the utility of telemedical services should be measured against. This report focuses on utility value compared with other medical methods and utility in relation to the perceptions of the users and patients of telemedicine. The utility of telemedical methods when compared with other medical methods is assessed in relation to on the basis of an economic cost-benefit analysis.

First lecture (County Director of Health in Trondheim, Northern Health Care Region)
 Bjarne M. Kvaloy (Director of the County Hospital in Midland, Central Health Care
 Region)
 Rolf H. Hestheim (IT Manager at the Central Hospital in Rogaland, Western Health
 Care Region)
 Torbjørn Hestheim (County politician in Østfold, Eastern Health Care Region)
 Peter Olsen (Director of the Central Hospital in Hedmark, Eastern Health Care
 Region)
 Bjørn Eide (The Norwegian Centre for Medical Informatics)
 Steinar Pedersen (Technical Department, Regional Hospital in Trondheim)
 Bård Paulsen (SINTEF (The Foundation for Scientific and Technical Research at the
 University of Trondheim))
 Finn Henry Hansen (Norwegian Research Centre)
 Arvid Kvaloy (Norwegian Industrial and Regional Development Fund, Trondheim)
 Bjørn K. Væstein (The Ministry of Trade and Industry)
 Kristin Næsson (The Ministry of Municipal and Regional Affairs)
 Ivar Gunnarsson (The Ministry of Health and Social Affairs)
 Gerd Vabø (The Ministry of Health and Social Affairs, Oslo)
 Thomas Nafstad (The Ministry of Health and Social Affairs, Oslo)
 The working party held two meetings on 16 October in Oslo, on 12 November in Trondheim, on 2-3 December in
 Trondheim and on 17 December in Hønefoss.

2.2 Description of the problem

In its deliberations the working party focused on two dimensions: utility and
 responsibility for implementation. These choices were made because it is essential that two
 aspects be assessed at an early stage. (1) Given investment in any further investment in
 technical solutions.
 In addition to these two dimensions the mandate includes regional and national policy
 dimensions. The report attempts to shed a critical light on the consequences for district
 policy of telemedicine. The focus on national policy came about as a result of the
 application from Trondheim county. This assumes that an investment in a telemedical
 centre will have national and considerable regional effects for the local community.
 Accordingly the working party also assessed the conceptual and technical aspects of
 telemedicine.

2.2.1 Dimension 1: Utility value

It has been important for the working party in the concluding reports about the utility of
 telemedical services. Knowledge of this is essential in order to be able to assess whether
 telemedical services should be implemented in the routine operations of the health services.
 However, the utility value can be applied to a number of factors. It has therefore been
 necessary to define what the utility of telemedical services should be measured against. The
 report focuses on utility value compared with other medical methods and ways in relation to
 the development of the work and patient care. The utility of telemedical methods
 when compared with other medical methods is assessed in relation to on the basis of an
 economic cost-benefit analysis.

2.2.2 Dimension 2: Responsibility for implementation

Telemedicine has an impact on a number of aspects of the health service. These can be collectively termed non-medical factors. Telemedicine impacts upon the organisation, administration and finances of the health service. As a result the lines of responsibility become unclear. It is therefore essential to delineate the responsibilities of the various players and between the various levels of administration.

3 Introduction

This chapter examines the foundations and preconditions for current policy on IT and telemedicine. A basic precondition is that IT and telemedicine should be viewed as means of achieving pre-defined goals. They should not be regarded as goals in themselves.

3.1 Definition and areas of application of telemedicine

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 programme Advanced Informatics in Medicine.

Telemedicine is not a new medical discipline, but rather a set of communication services that enable medical resources to be utilised 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 both 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 which may contain attachments consisting of text, images, video etc. These electronic documents are 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.

In theory this form of communication is the same as the system used at present for transferring form-based information: laboratory results, medical notes, referrals, prescriptions etc. The medical, economic and legal aspects of such services (EDI/multi-media based telemedicine) have not as yet been defined in any detail.

The Internet is expected to become an important technology for telemedical services. The primary health service and, where applicable, hospitals will be able to invite tenders for the appropriate diagnostic services and service suppliers will be able to retrieve the appropriate documents from the network of the primary doctor or hospital. These solutions will need to be tested in development projects.

2.2.2 Dimension 2: Responsibility for implementation

Telemedicine has an impact on a number of aspects of the health service. These can be collectively termed non-medical factors. Telemedicine focuses upon the organization, administration and finance of the health service. As a result the issue of responsibility becomes wider. It is therefore essential to delineate the responsibilities of the various players and between the various levels of administration.

3 Introduction

This chapter examines the boundaries and responsibilities for current policy on IT and telemedicine. A basic pre-condition is that IT will telemedicine should be viewed as means of achieving pre-defined goals. They should not be regarded as goals in themselves.

3.1 Definition and areas of application of telemedicine

Telemedicine can be defined as follows:
Telemedicine is defined as the use of information technology to deliver health care services across geographical boundaries. This definition is taken from the EC Commission's program 'Advanced Information Medicine'.

Telemedicine is not a new medical discipline, but rather a set of communication services that enable medical resources to be utilized in a new and better way. It is the telemedicine network - particularly in France - has largely equipped telemedicine in the form of remote consultation and remote diagnosis. A wide range of medical specialties, with the patient and doctor both being present at the same time, utilize this type of communication. A doctor or other health worker is usually present in the remote site as a doctor's office or in a local central hospital. From here they communicate with a specialist who gives a diagnosis or provides guidance on further treatment of the patient. Regional services are in operation in the fields of dermatology, ear, nose and throat, cardiology, pathology, and psychiatry. As a medical

technology computer 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 destination in the form of a message which may contain instructions consisting of text, images, video etc. These electronic documents are then processed and answered within an agreed period of time. Consultations in which the doctor(s) and patient do not need to be present at the same time are an aim to increase and coordinate. Furthermore, the equipment and human resources required for telemedicine are being tested because the new factor is in theory, of secondary or minor importance.

In theory this form of communication has been shown to be effective and it is possible to transfer information without the need for physical contact. However, there are a number of factors which may affect the quality of the service. The medical, legal and ethical aspects of telemedicine are being examined.

Telemedicine has not yet been defined in detail. The interest is focused on the use of information technology for telemedicine services. The primary health service and other specialized hospitals will be able to receive services for the diagnosis and treatment of patients and other specialists will be able to provide the specialist services from the network of the primary doctor or hospital. These activities will need to be tested in development projects.

3.2 The policy of the Ministry of Health and Social Affairs

Report No. 50 to the Storting (1993-94) "On cooperation and management - goals and means of achieving a better health service" and the report entitled "The Norwegian Way to the Information Society - Bit by Bit" compiled by the State Secretary Committee on IT (1996) form the basis for an action plan on the use of IT and telemedical solutions in the health service: "More health for every BIT" from 1996. The report formulated five goals:

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

This action plan is approaching the half-way stage. A summing-up prepared by the Ministry in May confirms that the visions and overriding objectives contained in 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 fulfilment of the action plan.

The Ministry is now in the process of drawing up a programme of measures for the remainder of the planning period of the IT action plan.² In this way the Ministry will make its priorities known and define its areas of responsibility. This will make it easier for the other parties involved, including the county municipalities, to identify areas in which they will have responsibility for implementation. Key areas for the Ministry will be standardisation and infrastructure measures, including networks. The work being done in connection with the action plan on IT must be anchored in the Ministry's other work.

3.2.1 IT and reforms in the health sector

All county municipalities are now required to draw up a five-year plan for acquisitions of medical equipment and information technology. These plans must be submitted to the Ministry for approval after the regional health care committees have given their views. This is a key point in the new grants programme. Although it is the counties that will receive refunds for their expenses within the defined limits, the regional health care committees have also been allocated a role, inter alia to ensure that infrastructure measures are funded under the new programme. The designated doctor scheme is another important reform that will have consequences as regards the use and development of IT and communications. This reform will initially affect the municipalities and central government, particularly the National Insurance Administration. However, it will also allow an IT network to be established that may have a considerable impact on the health sector at county level. The designated doctors will need to notify the National Insurance Administration of the patients on their lists and the National Insurance Administration will need updated information from the designated doctors as a basis for, for example, calculating refunds.

The reform introducing free hospital choice will require the county municipalities to maintain a thorough overview of the capacity at hospitals and quality indicators in various areas. The decision on the best hospital choice will be made by the designated doctors in consultation with their patients. The quickest way of securing the necessary information is by accessing hospital data bases from the doctor's PC. Hospitals that are able to make information of this type available to doctors and patients will have an advantage over those who do not offer this information in electronic form. Similarly, the ability to receive and transmit referrals and notes will represent a competitive edge, as a result of which the county municipalities will

3.2 The policy of the Ministry of Health and Social Affairs

Report No. 30 to the Storting (1997-98) "On cooperation and management - goals and means of achieving a better health service" and the report entitled "The Norwegian Way to the Information Society - Bill by the" compiled by the State Secretary Committee on IT (1999) form the basis for an action plan on the use of IT and telemedical solutions in the health sector. "Better health for every Bill" from 1999. The report formulated five goals:

1. Increase the competence of health personnel -> better diagnosis and treatment
2. Simplify the procedures for updating and storing information -> more data for the patient
3. Improve communication 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

The action plan is approaching the half-way stage. A monitoring report by the Ministry in May confirms that the vision and overriding objectives contained in it have been achieved. 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 fulfilment of the action plan.

The Ministry is now in the process of drawing up a programme of measures for the remainder of the planning period of the IT action plan 2. In this way the Ministry will make its priorities known and define its areas of responsibility. This will make it easier for the other parties involved, including the county municipalities, to identify areas in which they will have responsibility for implementation. Key areas for the Ministry will be assessment and implementation measures, including research. The work being done in connection with the action plan on IT must be anchored in the country's other work.

3.2.1 IT and telecare in the health sector

All county municipalities are now required to draw up a five-year plan for acquisition of medical equipment and information technology. These plans must be submitted to the Ministry for approval after the regional health care committee have given their views. This is a key point in the new health programme, although it is the counties that will receive funds for their expenses within the defined limits. The regional health care committee have also been allocated a role, inter alia to ensure that information resources are linked under the new programme. The designated doctor scheme is another important reform that will have consequences as regards the use and development of IT and communication. This reform will initially affect the municipalities and county governments, particularly the National Insurance Administration. However, it will also affect an IT network to be established that may have a considerable impact on the health sector at county level. The designated doctor will need to notify the National Insurance Administration of the patients on their list and the National Insurance Administration will send updated information from the designated doctor as a basis for, for example, calculating benefits.

The reform involving the hospital choice will require the county municipalities to maintain a thorough overview of the capacity of hospitals and county hospitals in various areas. The decision on the best hospital choice will be made by the designated doctor in consultation with their patients. The quickest way of securing the necessary information is by connecting hospital data bases from the doctor's PC. Hospitals that are able to make information of this type available to doctor and patients will have an advantage over those who do not offer this information in electronic form. Similarly, the ability to receive and transmit relevant and notes will represent a competitive edge, as a result of which the county municipalities will

need to include primary doctors in their IT strategies. Moreover, the free choice of hospital will involve an increased need for inter-hospital transfers of information on, for example, medical records, images, etc.

The implementation of the "Patient First" reform will make new demands on hospitals in terms of their organisation, overview of what stage patients have reached in the treatment process, quality of patient and treatment information and, not least, the real cost of treating the individual patient.

The increased use of treatment-related funding and the fact that hospitals will become more directly dependent on income deriving from the treatment of the individual patient will be accompanied by stricter requirements relating to financial control, patient administration systems and overview of patient costs.

Taken as a whole these reforms will involve a considerable challenge for the county municipalities as owners and the hospitals as operators. This in turn will involve a challenge as regards the ways in which IT and networks can best be used in improving the exploitation of resources and coordination, particularly with regard to information on results and quality.

3.2.2 Telemedicine: Part of a wider IT context

Telemedicine forms part of a wider IT context. The term "telemedicine" is often understood in a narrower sense than what can be found in a Norwegian health network. A Norwegian health network is a large overlying architecture whereas telemedicine is defined more specifically as the use of telecommunications technology as a basic part of a medical method. Telemedicine represents a specific and important means of achieving the stated goal of the Storting of cooperation and coordination between hospitals and the primary health service through increased organisation into networks. Telemedicine will also support the IT objective of increasing the skills of health personnel, inter alia through the use of distance learning and video conferencing. The Ministry has provided funds for telemedical activity in all health care regions in the form of equipment funding and resources for measures to promote cooperation at regional level. The time is now right to move on from individual projects towards a systematic and regular use of telemedicine in areas in which it has a demonstrably beneficial effect.

It is important to the Ministry that telemedicine should serve as a means of achieving a health sector that is at all times the best available. The Ministry is therefore focusing on the financial, administrative, organisational and legal consequences of telemedical activity. This is of greater importance than the technology itself.

3.3 National competence centres

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. For the purposes of this report the descriptions of the communities in question will be confined to those with formalised roles in this area in relation to the Ministry. The development of telemedicine in the hospitals is discussed in Chapter 4 which considers the current status of telemedicine use in the regions.

The National Centre on Emergency Communication in Health (KoKom) was established in Bergen in the autumn of 1997. The primary functions of the centre are to coordinate the use of the medical emergency despatch service, encourage technical and administrative development and to secure the development and maintenance of national requirements. KoKom will function as a communications centre in the acute care chain. Ongoing projects include computer systems for the emergency despatch service and for fleet management. The

need to include primary doctors in their IT strategies. Moreover, the free choice of hospital will involve an increased need for inter-hospital transfer of information on, for example, medical records, wages, etc.

The implementation of the "Patient First" reform will make new demands on hospitals in terms of their organization, overview of what stage patients have reached in the treatment process, quality of patient and treatment information and, not least, the real cost of treating the individual patient.

The increased use of treatment-related funding and the fact that hospitals will become more directly dependent on income deriving from the treatment of the individual patient will be accompanied by other requirements relating to financial control, general administration systems and overview of patient costs.

Taken as a whole these reforms will involve a considerable challenge for the country's municipalities as owners and the hospitals as operators. This in turn will involve a challenge as regards the ways in which IT and networks can best be used in support of the organization of resources and coordination, particularly with regard to information on costs and quality.

3.2.2 Telemedicine: Part of a wider IT context

Telemedicine forms part of a wider IT context. The term "telemedicine" is often understood in a narrower sense than what can be found in a Norwegian health network. A Norwegian health network is a large overarching structure where information is shared more

specifically as the use of telecommunication technology as a part of a medical method. Telemedicine represents a specific and important method of achieving the stated goal of the setting of cooperation and coordination between hospitals and the primary health services through increased organization into networks. Telemedicine will also support the IT context of increasing the skills of health personnel, inter alia through the use of distance learning and video conferencing. The training provided for telemedicine activity in all health care regions in the form of equipment testing and research for medical telemedicine cooperation at regional level. The point is not to create inter-hospital support towards a system which is not intended to be used in a way which is not a demonstrably beneficial effort.

It is important to the Ministry that telemedicine should serve as a means of widening a health sector that is at all times the best available. The Ministry is therefore concerned that financial, administrative, organizational and legal conditions of telemedicine activity. This is of great importance than the technology itself.

3.3 National competence centres

A wide range of national committees are involved in a system of health care in the development of IT-based solutions and services in the health sector. For the purpose of this report the descriptions of the committees in question will be confined to those with formalized roles in that way in relation to the Ministry. The development of telemedicine in the hospitals is discussed in Chapter 4 which concludes that the current status of telemedicine is in the regions.

The National Centre on Emergency Communication is finally (2000) was established in Bergen in the autumn of 1997. The primary function of the centre was to coordinate the use of the medical emergency dispatch service, emergency telephone and other services development and to secure the development and maintenance of national emergency communication. The centre will function as a communication centre in the acute care chain. Ongoing projects include computer systems for the emergency dispatch service // for that management. The

Centre will develop competence and provide advice as well as participating actively in the development of systems requirements and uniform procedures. It is intended that joint venture projects should be established involving the Centre and the various intellectual communities.

Shared Health Care in Trondheim was established in 1997 with the following goals in mind: To help ensure that we achieve a uniform and efficient handling of patients which is the best attainable in terms of quality and economy, to contribute to the improvement of cross-disciplinary cooperation within the health service, to enable patients to become informed and aware users of the health service and to contribute to the development of optimum methods of communication between the various areas of the health service. Shared Health Care is involved in the RIT-2000 project and is in the process of developing a national electronic medical handbook.

The Norwegian Centre for Medical Informatics (KITH) is a limited company financed by means of income from individual assignments, is located in Trondheim and is owned by the Ministry of Health and Social Affairs, the Norwegian Association of Local Authorities and Sør-Trøndelag County Municipality. KITH was founded in 1991 to contribute to the uniform and coordinated development and use of information and communications technology for the health sector as a whole and the establishment of common information resources and a common information base in the health service. Key aspects of KITH's core activities include the creation of technical and health-related standards and specifications and the development of strategies for and the provision of advice to participants in the health service. At present most of KITH's assignments and expertise are focused on following up the Ministry of Health and Social Affairs' IT action plan "More health for every BIT".

In addition, KITH takes on a considerable number of assignments for the health care regions, county municipalities and health care institutions, particularly within the area of establishing regional health networks.

The Telemedical Department (TMA) at the Regional Hospital in Tromsø (RiTø) is a research and development department and works on the development, testing and evaluation of modern information and communications technology within the health service. As a national centre the Department also functions as an advisory body to the national authorities. TMA also has an international profile. At present the World Health Organisation (WHO) is assessing the Department with a view to making it a global cooperation centre for telemedicine. TMA's vision is that telemedicine should help make health services available to all. The overriding objectives of the Department are:

- *To provide patients with better health care 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 the Department produces telemedical solutions and evaluates them from the perspective of diagnostic quality and legal, organisational and economic preconditions and consequences.

At present the Telemedical Department forms an independent department within the Regional Hospital in Tromsø. The Department has no formal ties to the university. Although the creation of such ties is being considered no final decision has been taken.

NorFa - the Nordic Academy for Advanced Study - funds a 3-year guest professorship at the department. Professor Hans Kollberg of the University of Uppsala holds this post. Four of the Department's staff have started work on their doctorates: one within technology and three within social science.

Centre will develop competences and provide advice as well as participating actively in the development of systems, programmes and national procedures. It is essential that joint venture projects should be established involving the Centre and the various industrial communities.

Shared Health Care in Scandinavia was established in 1997 with the following goals in mind: To help ensure that we achieve a national and efficient handling of patients which is directed towards the patient in terms of quality and economy, to contribute to the improvement of cross-disciplinary cooperation within the health sector, to provide patients to become informed and aware users of the health service and to contribute to the development of optimum methods of communication between the various areas of the health sector. Shared Health Care is involved in the RIT-2000 project and is in the process of developing a national electronic medical handbook.

The Norwegian Centre for Medical Informatics (KITH) is a limited company financed by means of various forms of individual assignments, is located in Trondheim and is owned by the Ministry of Health and Social Affairs, the Norwegian Association of Local Authorities and 24 Trondheim County municipalities. KITH was founded in 1991 to contribute to the national and coordinated development and work, information and communication technology for the health sector as a whole and the establishment of various information resources and a common information base in the health sector. Key aspects of KITH's core activities include: the creation of technical and health-related standards and specifications and the development of strategies for and the provision of advice to customers in the health sector. At present most of KITH's assignments and expertise are focused on following up the Ministry of Health and Social Affairs' IT action plan "Action points for every IT".

In addition, KITH takes on a considerable amount of assignments for the local care regions, county municipalities and health care institutions, particularly within the area of establishing regional health networks.

The Telemedical Department (TMA) at the Regional Hospital in Trondheim (RHT) is a research and development department and works on the development, testing and evaluation of modern information and communication technology within the health sector. As a national centre the Department also functions as an advisory body to the national authorities. TMA also has an international profile. At present the World Health Organization (WHO) is assessing the Department with a view to making it a global cooperation centre for telemedicine. TMA's vision is that telemedicine should help solve health services available to all. The overriding objectives of the Department are:

- To provide patients with better health care with the aid of telemedicine
 - To create and disseminate knowledge about telemedicine
 - To ensure that telemedicine contributes to a high quality
- To further these objectives the Department produces telemedical solutions and evaluates them from the perspective of diagnostic quality and legal, organisational and economic preconditions and consequences.

At present the Telemedical Department works in collaboration with the Regional Hospital in Trondheim. The Department has no formal ties to the university. Although the creation of such ties is being considered, no final decision has been taken. Nord's, the Nordic Academy for Advanced Study - Trondheim, is a joint grant and research at the department. Professor Hans Kallenberg at the University of Ljubeck holds the post of the Department's staff have started work on their doctorate, over which technology and have within social science.

3.4 Telemedicine from an international perspective

Internationally, telemedical services are growing rapidly. Most industrial nations have invested relatively large sums on research into telemedicine. There are a number of key features to this work. One is that in countries with health services comparable to the Norwegian system, funding is provided in the national budgets. The other is that private companies finance telemedical activities in countries in which the health service is privately funded. Furthermore teleradiology is the service with the highest volume in most countries. The United States, Canada, Australia, Israel and the Western European nations, including the Nordic countries, have made the most progress within telemedicine.

In theory telemedicine has no natural geographical boundaries. Even today Internet technology allows the establishment of international working groups specialising in difficult diagnoses for patient groups with rare and serious medical conditions. Many countries, the United States and Israel being the prime examples, take a global view and aim to make telemedical health services and diagnostic centres available throughout the world to anyone who can afford to pay. The World Health Organisation is also starting to adopt telemedical solutions.

The organisation of medical knowledge into networks will result in the expansion of Norwegian medical communities through the inclusion of foreign, acknowledged, clinical communities. This opens the way for quality improvement and standardisation of medical treatment. In the same way, joint action within teaching could bring about Nordic cooperation in which the benefits would be teaching of a higher standard and the more efficient use of teachers.

Technological development combined with reductions in the price of telecommunications services will allow telemedicine to be transferred to developing nations, enabling them to improve their ability to care for their own patients.

4 The use and development of telemedicine in the health care regions

This chapter is based on the information reported to the secretariat of the working party by representatives of the health care regions. These contributions are lodged with the Ministry

4.1 Health Care Region 1

At a meeting held on 15 February 1996 the Regional Health Committee for Region 1 adopted a decision to apply to the Ministry of Health and Social Affairs for funds for regional health cooperation. The funds were for establishing a hospital network based on information technology for two-way picture and sound communication between somatic hospitals in the region. The objective of the project: to establish an information technology and telemedicine network to include eight somatic hospitals in the health care region.

4.1.1 Current status

An ATM network (10 Mbit) and 2 Mbit) comprising 9 hospitals and Otta Health Centre in Sel Municipality has been established. In other words the project is more extensive than originally planned. The network was launched in September 1998. Each of the hospitals and Otta Health Centre has installed a package of equipment comprising a PC unit enabling the

3.4 Telemedicine from an international perspective

Internationally, telemedical services are growing rapidly. Most industrial nations have invested relatively large sums on research into telemedicine. There are a number of key features to this work. One is that in countries with health services comparable to the Norwegian system, funding is provided in the national budget. The other is that private companies finance telemedical activities in countries in which the health service is not state funded. Furthermore, telemedicine is the service with the highest volume in most countries. The United States, Canada, Australia, Israel and the Western European nations, including the Nordic countries, have made the most progress within telemedicine.

In theory, telemedicine has no natural geographical boundaries. Even today, however, technology allows the establishment of international working groups, specialists in different diagnostic or patient groups with very and various medical conditions. Many countries, the United States and Israel being the prime examples, take a global view and aim to make telemedical health services and diagnostic centres available throughout the world to anyone who can afford to pay. The World Health Organization is also starting to seek telemedical solutions.

The organization of medical knowledge and networks will reach in the near future of Norwegian medical communities through the adoption of foreign, technological, clinical communities. This opens the way for quality improvement and standardization of medical treatment in the same way, joint action within learning communities about health cooperation in which the benefits would be teaching of a higher standard and the more efficient use of teachers.

Technological development combined with telemedicine in the form of telemedicine services will allow telemedicine to be extended to developing nations, enabling them to improve their ability to care for their own patients.

4 The use and development of telemedicine in the health care regions

This chapter is based on the information reported in the accounts of the working party by representatives of the health care regions. These contributions are judged with the following

4.1 Health Care Region I

At a meeting held on 12 February 1990 the Regional Health Committee for Region I adopted a decision to apply to the Ministry of Health and Social Affairs for funds for regional health cooperation. The funds were for establishing a hospital network based on telemedicine technology for two-way picture and sound communication between several hospitals in the region. The objective of the project is to establish an information technology and telemedicine network to include eight somatic hospitals in the health care region.

4.1.1 Current status

An ATM network (10 Mb/s and 5 Mb/s) connecting 9 hospitals and 10 health centres in Sol Municipality has been established. In other words the patient is more extensive than originally planned. The network was launched in September 1987. Each of the participating health centres has installed a package of equipment consisting of a PC and a video camera.

hospital to participate in video conferences and a PC unit allowing the exchange/transmission of radiographs. The larger hospitals that are linked to the network by means of 10 Mbit ATM lines are capable transmitting high quality video images in real time. The other hospitals and Otta Health Centre are linked to the network by means of 2 Mbit ATM lines and are able to transfer high quality video images after downloading. The following projects have been started:

- *Testing of the network in close dialogue with the supplier of the system.*
- *A teleradiology service between Otta Health Centre and Lillehammer County Hospital. Since the launch, over 800 radiographic examinations have been sent to and from Lillehammer. Moreover Otta has also unburdened the X-Ray Department at Lillehammer by taking on some of the examinations. The picture quality is very satisfactory and it is estimated that savings in travel costs already exceed NOK 1 million. The ATM network is also functioning well in the area of teleradiology within the primary health service.*
- *Meetings between technical groups. The ambulance service in Hedmark, for example, now uses video conferencing.*

Oppland and Hedmark county municipalities are in the process of implementing a new shared EDI solution. It will permit the transfer of all types of messages between the hospitals and the primary health service. The solution will be scalable allowing the use of several types of messages, such as laboratory results, radiographic results, notes, referrals, out-patient settlements etc. Messages will be sent via the social security-health mailbox which it is intended will function as a national messaging exchange for electronic document transfers within the health service in Norway.

4.1.2 Definition of the problem

The development of cooperation with the primary health service will be important. The boundaries of the health care regions are changing. It is therefore of particular importance that cooperation also be established with the "new" counties. The hospitals in these counties should be linked into the network at the earliest opportunity.

4.1.3 Future plans

Work is under way to establish a mini-invasive training centre for disciplines within surgery, internal medicine and invasion radiology. The centre is being built at Ullevål Hospital (in Oslo) but will serve the whole of Health Care Region 1. The centre also utilises the technology at the Intervention Centre at the National Hospital with the aid of an ATM network.

The training centre for mini-invasive surgery offers practical training within all types of everyday surgery including gynaecology. The key function of the centre will be to supplement the internal training of specialists provided at the hospitals in the region with a view to reducing training time. This will allow access to specialists at all hospitals to be improved. The ATM network links these hospitals together so that they function as a single hospital when it comes to using instructional films and practical procedures such as endoscopy (gastroscopy, colonoscopy and bronchoscopy etc.) Virtual reality-based training programmes could be very cost effective because the ATM network permits extensive multiple use.

An in-house communications network is being established at Ullevål Hospital and will function as a tool for all employees. The intranet will also feature training programmes for patients and their relatives. This architecture could become the "joint property" of the entire regional intranet. The intranet/training modules for patients will be available in mid-1999.

hospital to participate in video conferences with a PC and allowing the exchange of information of radiology. The laser printers that are linked to the network by means of 10 MHz ATM lines are capable of transmitting high quality video images in real time. The other hospitals and the Health Centre are linked to the network by means of 1 MHz ATM lines and are able to transfer high quality video images after downloading. The following projects have been started:

- Testing of the network in other hospitals with the objective of the system.
- A telemedicine service between the Health Centre and the Hospital. Since the launch, over 500 telemedicine consultations have been sent to and from the Hospital. Moreover, the Health Centre has also introduced the 24-hour Department of Radiology on some of the examinations. The patient giving a teleconsultation and a specialist that receives the travel costs without charged VOD 1 without the ATM network is also functioning well in the area of radiology with the primary health care.
- Meetings between technical groups. The technical services in hospitals, for example, now work with video conferencing.

Optical and Hologram county radiology are in the process of implementing a new digital EDI solution. It will permit the transfer of all types of messages between the hospitals and the primary health care. The solution will be capable of sending the most varied types of messages, such as laboratory results, radiology results, orders to other departments, referrals etc. Messages will be sent via the network through a mailbox which will be intended will function as a national messaging exchange for electronic document transfer within the health service in Norway.

4.1.2 Definition of the problem

The development of cooperation with the primary health service will be important. The boundaries of the health care system are changing. It is therefore of particular importance that cooperation also be established with the new entities. The hospitals in these counties should be linked into the network with a certain opportunity.

4.1.3 Future plans

Work is under way to establish a national network for the primary health service, internal medicine and general radiology. The network is being built at Ullevål Hospital in Oslo) but will serve the whole of Eastern Norway. The centre also makes the technology of the Inter-Region Centre a first national hospital with the aid of an ATM network. The ongoing centre for radiology is a priority, either practical thing within all types of everyday urgent radiology examinations. The 17 hospitals of the centre will be independent the national centre of radiology, involved in the hospital in the region with view to reducing waiting time. This will allow access to specialists at all hospitals to be improved. The ATM network links these hospitals together so that they function as a single hospital when it comes to using radiology and pathology. The 17 hospitals will be a network of pathology, cytology and histology etc. 1 virtual reality-based training programme could be very cost effective because the ATM network permits extensive multiple use.

An in-house communication network is being established at Ullevål Hospital and will function as a tool for all employees. The network will also feature training programmes for patients and their relatives. This network could become the "main program" of the county regional network. The internet training modules for patients of the network is also being

In connection with the establishment of network services in Health Care Region 1, a server capable of handling documents may be included in the network. This would increase the utility of the network in that documents could be made available to all parts of the network. Following the decision to locate a radiation therapy unit in Gjøvik, an application will be submitted for a communications link to be routed to centrally located radiation therapy departments.

The region is examining the scope for expansion and the equipment requirements in the following areas:

- *Multi-conferencing facilities within the ATM network.*
- *Enhanced ISDN capacity out of the ATM network.*
- *Telepathology equipment/solution.*
- *More machines capable of coding video so that this need not be confined to Ullevål Hospital.*

The following network activities are planned:

- *An orthopaedic network for teaching and treating patients between orthopaedic department.*
- *A gastric network for internal medicine and surgical gastroenterology.*
- *A cardiology network. Here the possibility of connecting existing diagnostic imaging equipment will be tested.*
- *A teleradiology service between Gjøvik County Hospital and Lillehammer County Hospital. MR in particular but also other forms of examination.*
- *A teleradiology service at the Central Hospital in Hedmark between the departments in Elverum and Hamar. Teleradiology at this hospital, which has activities on two sites, offers scope for reorganising the work of the department. The project includes measures to enhance quality, such as new scope for double investigation, but also the simplification of shifts so that the duty radiologist can cover both Elverum and Hamar.*
- *Training within a number of disciplines including for medical students currently working in the regions and undergoing specialist training.*

4.2 Health Care Region 2

On behalf of the Norwegian Radium Hospital (DNR) Health Care Region 2 applied for and received a grant of NOK 3.2 million for 1996 to establish telemedical services. The region was thereby able to initiate a number of projects and to examine the basic medical and technical preconditions for regional cooperation based on telemedicine. On 1 November 1996 the Regional Health Committee approved the establishment of a regional working party on telemedicine.

4.2.1 Current status

DNR has been experimenting on transferring medical images over the telecommunications network for over 15 years and similar projects have been conducted at the National Hospital (RH). Video conferencing equipment has been used in various applications for a number of years. Smaller projects involving the transmission of images for diagnostic consultations are being conducted in several locations. Telemark Central Hospital is heading a national telemedicine project within urology. Skien and Porsgrunn are now holding network-based morning meetings and the hospitals have been integrated by means of telecommunications technology. The first telemedical application designed for routine use was introduced in 1994 in the form of a telecom based frozen section service between Aust-Agder Central Hospital and DNR. DNR also heads an international telemedicine project which has inter alia developed a new digital work station for telepathology.

In connection with the establishment of network services in Health Care Region 1, a review of existing documents may be included in the network. This would ensure the utility of the network in that documents could be made available to all parts of the network. Following the decision to create a radiation therapy unit in Glinde, an application will be submitted for a communications link to be tested in central, located radiation therapy departments.

The region is examining the scope for expansion and the equipment requirements in the following areas:

- Areas requiring further testing within the TTT network
- Estimated 1990 costs for the TTT network
- Technology requirements
- How machine capacity of existing sites so that this need not be confined to Glinde Hospital

The following network activities are planned:

- An oncologic network for teaching and training patients in new oncologic equipment
- A genetic network for general medicine and surgical oncology
- A radiology network. This network is currently being developed in the region and will be tested.
- A technology service between Glinde Hospital and Glinde Hospital. This is particularly important for the testing of new equipment.
- A technology service at the central hospital in Glinde. This is particularly important for the testing of new equipment.
- A technology service at the central hospital in Glinde. This is particularly important for the testing of new equipment.
- A technology service at the central hospital in Glinde. This is particularly important for the testing of new equipment.
- Training within a number of disciplines including technical training currently being provided in the region and oncology present therapy.

4.2 Health Care Region 2

On behalf of the Norwegian Radiation Board, Health Care Region 2 applied for and received a grant of NOK 2.2 million for 1990 to establish technical services. The region was thereby able to initiate a number of projects and to complete the first medical and technical installations for regional cooperation based on standards. On 1 November 1990 the Regional Health Committee approved the establishment of a regional working party on telemedicine.

4.2.1 Current status

DMR has been experimenting on transferring medical images over the radio network since 1987. In over 15 years and similar experiments have been conducted at the National Hospital (NH). Video transmission equipment has been used in various applications for a number of years. Smaller projects involving the transmission of images for diagnostic consultation are being conducted in several hospitals. Technical studies for the development of a regional telemedicine project within oncology, gynecology and pediatrics are now being carried out. In the form of a telemedicine network between Glinde Hospital and Glinde Hospital in 1984 and DMR also heads an international telemedicine project which has been developed a new digital work station for telemedicine.

The regional hospitals and central hospitals are well equipped for the future with good IT departments. Specialist departments such as the Intervention Centre at RH, the Department of Medical Physics and Technology and the Section for Digital Pathology at DNR have specialist expertise which will allow the maximum returns to be achieved on telemedical investments in the region.

Norwegian and international telecom companies have now identified telemedicine as a key market and a number of projects have been launched aimed at enabling the companies to offer broadband networks at an acceptable price. Fourteen of these companies have established a joint project based on EU funds (Optimum). Optimum will use Health Care Region 2 as business case in its studies. Over time it will give the region the opportunity to test various telemedical solutions between the central hospitals using a broadband network. The cooperation between Optimum and Health Care Region 2 will give the region insight into and access to the new technology currently being developed for broadband networks.

4.2.2 Definition of the problem

The individual counties have defined a number of needs related in particular to the two regional hospitals. However, the region lacks the necessary telemedical equipment to implement joint venture projects and nor does RH have adequate telemedical equipment. Furthermore, both RH and DNR will require additional personnel resources during the initial phase to enable them to offer the telemedical services required by the region.

Lack of bandwidth and the high cost of using telecommunications have also been limiting factors to date. As a result, a great deal of resources have been expended on developing solutions that can operate on low bandwidth. Nevertheless, projects have now been initiated which it is hoped will offer broadband services at an acceptable price.

4.2.3 Future plans

Health Care Region 2 has chosen to give priority to consultations and communications between the hospitals. Appropriate telemedical measures in relation to the first line service have accordingly not as yet been assessed. Furthermore, it has been agreed that for the present investments in equipment for general video conferencing should be confined to hospitals with teaching positions and that institutions with central hospital functions should be given priority as regards radiology and pathology solutions. There is general agreement that measures and functions relating to the two regional hospitals should have the highest priority. For the present, Health Care

Region 2 has opted to concentrate on telemedical applications within the areas of pathology, radiology, clinical conferences and distance learning.

Acquisition of the following equipment has been proposed:

- *Telepathological equipment for the central hospitals and RH.*
- *Teleradiological equipment for the central hospitals and RH and DNR.*
- *Video conferencing equipment for hospitals with teaching positions. Three for RH and two for DNR.*
- *Oncological quality networks (equipment).*
- *Premises for telemedicine at DNR.*
- *Short-term appointments at the regional hospitals.*

The regional hospitals and central hospitals are well equipped for the future with good IT departments. Specialist departments such as the Interventional Centre at RH, the Department of Medical Physics and Technology and the Section for Digital Pathology at DNR have specialist expertise which will allow the treatment centre to be advanced on technical investment in the region.

Norwegian and international telecom companies have now identified themselves as a key market and a number of projects have been launched aimed at enabling the companies to offer broadband networks as an accessible price. Formation of these companies have established a joint venture based on EU funds (Optimum). Optimum will use Health Care Region 2 as business case in its studies. Over time it will give the region the opportunity to test various telemedical solutions between the central hospitals using a broadband network. The cooperation between Optimum and Health Care Region 2 will give the region the right into and access to the new technology currently being developed for broadband networks.

4.2.2 Definition of the problem

The individual counties have defined a number of needs related to particular inpatient regional hospitals. However, the region lacks the necessary technical equipment to implement joint venture projects and not does RH have adequate telemedical equipment. Furthermore, both RH and DNR will require additional general resources during the initial phase to enable them to offer the telemedical services requested by the region. Lack of bandwidth and the high cost of using telecommunication have also been limiting factors in data. As a result, a great deal of resources have been expended on developing solutions that can operate on low bandwidth. Such existing projects have not been initiated which it is hoped will offer broad-based services at accessible prices.

4.2.3 Future plans

Health Care Region 2 has chosen to give priority to consultation and training activities between the hospitals. An ongoing telemedical network is to be set up in the first instance have accordingly not as yet been started. Furthermore, it has been agreed that the two present telemedical investments for general and central hospitals should be continued at hospitals with teaching positions and that investments in central hospital facilities should be given priority to regional technology and pathology solutions. There is general agreement that research and training related to the two regional hospitals should have the highest priority for the present Health Care

- Region 2 has opted to concentrate on telemedical applications within the area of pathology, radiology, clinical chemistry and disease monitoring.
- Acquisition of the following equipment has been proposed:
- Telepathological equipment for the central hospitals and RH
 - Telelaboratory equipment for the central hospitals and RH and DNR
 - Video conferencing equipment for hospitals with teaching positions. Plans for RH and DNR for DNR
 - Oncological teaching network (Optimum)
 - Training for telemedicine in DNR
 - Short-term deployment of the regional network

4.3 Western Health Care Region

As part of the Regional Health Network (RegNett) project an extensive network of external communications solutions between health units in the first and second line service was built up during the period 1996 to 1998.

4.3.1 Current status

The project is based on the framework plan adopted for this work in the region. Particular emphasis has been placed on strengthening cooperation between administrative levels and across county boundaries. The project has received broad political, technical and administrative support from the county municipalities involved and has achieved fruitful cooperation with the primary health service.

At a national level the project is linked to the Ministry's standardisation programme and to the work on implementing a National Health network in accordance with the adopted strategic plan.

In a European context RegNett is part of the project "Coordination and Continuity in Health Care". This project receives funding through the EU's fourth framework programme and is aimed in particular at standardising message content at a European level. The project is financed with funds from the Ministry, the Norwegian Association of Local Authorities, the European Union and the National Insurance Administration.

Below, the most important sub-projects in the RegNett project are discussed. It is important to appreciate that the projects are not isolated individual projects, but that they are highly coordinated in terms of both technical choices and network building.

In the field of neurophysiology image communication has been established between Haukeland and Førde. A similar solution is planned between hospitals in Rogaland County. In the field of telepsychiatry, several types of video conferencing-based forums have been established enabling direct patient contact and consultation, to which the primary health service in Rogaland is also connected. Traditional local teaching within ENT has been replaced by conferences and demonstrations from Haukeland Hospital. PC-based ECGs and standardised internal and external transmissions have been established in cooperation with the company MedIT. Primary doctors are involved. Conferencing and image transmission networks using both PC equipment and traditional video conferencing equipment are used for cancer and cardiological purposes. A dermatology project involving remote diagnosis of skin diseases between primary doctors and hospitals is being tested. About 40 video conferencing studios have been set up in the region, and there is extensive organised distance learning.

Blood bank personnel, physiotherapists and psychologists are the active professions. Although EDI is not ordinarily understood as part of telemedicine, the establishment of EDI communications has been one of RegNett's most important activities. For the most part this involves communication between primary doctors and hospitals with the transmission of large numbers of messages in the form of laboratory results, notes and referrals. In cooperation with the National Insurance Administration, the project has equipped the practices of primary doctors with their own communications servers, amongst other reasons to ensure data security. The service covers most of the primary health service in the region and approximately 95% of all laboratory results are now transferred electronically. Electronic prescription transfer was planned but has not been implemented.

4.3 Western Health Care Region

As part of the Regional Health Network (RHNET) project an extensive network of strategic communication solutions between health care in the West and several other services was built up during the period 1995 to 1997.

4.3.1 Current status

The project is based on the 5 companies that signed for this work in the region. Partnerships has been placed on strategic communication between administrative for the West across county boundaries. The project has been a broad political, technical and administrative support from the county municipalities involved and has achieved fruitful cooperation with the primary health services.

At a national level the project is linked to the Ministry's communication programme and to the work on implementing a National Health Network in accordance with the adopted strategic plan.

In a European context RHNET is part of the project "Coordination and Continuity in Health Care". This project receives funding through the XI health research programme and is aimed in particular at strengthening message content at a European level. The project is financed with funds from the Ministry, the Norwegian Research Council of Health, the European Union and the National Insurance Administration.

Below, the most important sub-projects in the Region are described. It is important to appreciate that the projects are not isolated individual projects, but that they are highly coordinated in terms of both technical choices and service choices.

In the field of neurophysiology, a large communication has been established between Hordaland and Helse. A similar solution is planned between Hordaland and the Westland County. In the field of telepsychiatry, several forms of video conferencing have been established, enabling direct patient contact and consultation, in which the primary health service in Hordaland is also connected. Hordaland local teaching within HLT has been reported by conferences and demonstrations from Hordaland, Hordaland, Hordaland, and standardized internal and external communication have been established in cooperation with the company Mølle. Various factors are involved: Organizational and project management, networks using both PC equipment and traditional video conferencing systems are used for cancer and cardiovascular purposes. A telemedicine project is also in progress, regarding disease diagnosis, primary diagnosis and treatment, and includes a home care, about 40 video conferencing studios have been set up in the region, and there are also training and development studios. Blood bank, ultrasound, electrocardiogram and radiology are the other projects.

Although EHS is not directly involved in any of the activities, the established RHNET communication has been one of Hordaland's most important activities. For the West, the large communication between primary health and hospital with the participation of large numbers of patients in the form of laboratory results, water and sewage in cooperation with the National Institute of Statistics, the project has equipped the practice of primary health with their own communication system, and not only other means to manage data security. The communication about the patient has a very high level, and approximately 95% of all laboratory results are now considered electronically. The project's main task was planned but has not been implemented.

4.3.2 Definition of the problem

The experience of the region has been that the main challenges relate not to technological but to organisational factors. It has been difficult to secure sufficient time for the specialists concerned to pass on the required expertise. Furthermore, some of the sub-projects have not been sufficiently strongly anchored in the medical communities. The experience of the region has been that if the service is to be used, its availability must be very high.

It is important to stress that the projects have also offered clear benefits. An improvement in medical quality has been documented. Moreover, interdisciplinary cooperation across levels affords increased security and greater scope for developing competence at several levels in the health service. Cooperation between the various professional groups in the region has been improved, the flow of information is more structured, and it is transferred faster, more securely and at lower cost than in the past. The projects have also demonstrated that there are considerable benefits for the patient, particularly as regards travel to and from regional and central hospitals.

4.3.3 Future plans

A technical infrastructure for a regional intranet has been built up which so far takes in four hospitals. It is intended that selected primary doctors will be connected as part of Rogaland's Consultancy Project for Practices. Certain data protection issues relating to this solution are still under review. In general, a great deal of work remains to be done on the structure of the contents and organisation of intranets remains to be done.

4.4 Central Norway Health Care Region

Although to date use of telemedicine in the region has been limited, it is viewed as useful for selected patients. The users - primarily doctors - see telemedicine as a useful tool in treating patients. In particular it has been pointed out that the use of telemedicine has created a stronger bond between the hospitals in the region.

4.4.1 Current status

Cooperation within Central Norway Health Care Region on information and telecommunications technology and telemedicine started in the mid-1980s with the purchase and development of a shared patient administration system (PAS) and continued with technical systems within clinical chemistry, radiography and microbiology. At present a personnel resource system is being developed. The system is undergoing testing at the County Hospital in Molde (FSM).

As an aid in teaching and with a view to simplifying communications between psychiatric out-patients clinics for children and young people (BUPs) in the region, video conferencing systems have been introduced at all BUPs. This has resulted in less travel and increased availability because the video conferencing system is used in the counselling service. As part of its teaching service the University of Trondheim offers all hospitals in the region its "Lecture of the Month". This service is also available to health institutions outside the region. A video conferencing system has been installed at the hospitals in connection with the service.

Between 6 April 1994 and 1 October 1998 a total of 84 pathology tests were conducted between Inherrad Hospital (IHS) and the Regional Hospital in Trondheim (RiT). The pathology service between Namdal Hospital (NDS) and RiT was stated to be approximately one examination per week. This is now significantly smaller. The Central Hospital in Møre

4.3.2 Definition of the problem

The experience of the region has been that the main challenges relate not to technological but to organisational factors. It has been difficult to secure sufficient care for the population concerned in parts of the region. Furthermore, some of the sub-problems have not been sufficiently strongly addressed in the medical communities. The experience of the region has been that if the service is to be good, its availability must be very high. It is important to stress that the projects have also affected other hospitals. An improvement in medical quality has been documented. However, patient safety, especially across levels, efforts increased security and patient safety for development of computerised systems in the health service. Cooperation has with the various professional groups in the region has been improved, the flow of information is more structured, and it is structured, more security and at lower cost than in the past. The projects have also demonstrated that there are considerable benefits for the patient, particularly as regards travel to and from regional and central hospitals.

4.3.3 Future plans

A technical infrastructure for a regional network has been built up which will be used in the hospital. It is intended that selected primary doctors will be connected as part of Hospital's Consistency Project for Practice. Certain data protection laws relating to this include the skill under review. In general, a great deal of work remains to be done on the structure of the contents and organisation of network resources to be done.

4.4 Central Norway Health Care Region

Although to date one of the most advanced in the region has been limited, it is viewed as useful for selected patients. The user - primary doctor - are considered as a useful tool in managing patients. In particular it has been pointed out that the use of telemedicine has created a stronger bond between the hospitals in the region.

4.4.1 Current status

Cooperation within Central Norway Health Care Region on information and telecommunication technology and telemedicine started in the mid 1980s with the purchase and development of a shared patient administration system (PAS) and worked with technical systems within clinical chemistry, radiology and pathology. At present a personal resource system is being developed. The system is undergoing testing at the County Hospital in Steinkjer (HSE).

As an aid in teaching and with a view to strengthening communication between physicians and patients clinics in clinics and young people (HSE) in the region, video conferencing systems have been introduced as an HSE. Two are intended to test novel and advanced availability because the video conferencing system is used in the teaching service. A part of its teaching service the University of Trondheim offers all hospitals in the region. "Lecture of the Month". This service is also available to health institutions outside the region. A video conferencing system has been installed at the hospitals in connection with the service.

Between 6 April 1994 and 1 October 1995 a total of 84 pathology tests were conducted between Inland Hospital (HIS) and the Regional Hospital in Trondheim (RIT). The pathology service between Inland Hospital (HIS) and RIT was tested with a pathology one examination per week. This is now significantly smaller. The county hospital in Steinkjer

and Romsdal (SMR) in Ålesund sends CT images to RiT for assessment in connection with neurosurgery. It is technically feasible to send any information available in digital form: isotope tests, MR and angiographic images and some x-ray images, but RiT has no work stations capable of accepting digital images. The images therefore have to be sent directly to a printer, which has limited capacity. The use of laparoscopic surgery between SMR and RiT has been limited. This is because of inadequate organisation at both ends. The gastrosurgeons hold monthly regional video conferences. The urologists at SMR are part of a nationwide telemedical teaching scheme. Some of the hospitals in the region are part of a nationwide project involving the training of geriatricians by means of video.

The regional health plan for Central Norway was adopted in 1995. By introducing standardised electronic messages for hospitals and doctors' practices in the Central Norway Health Care Region, the region is aiming to achieve:

- *A more comprehensive range of services involving formalised and structured cooperation between the first and second-line services.*
- *Well-planned and structured cooperation between specialists in private practice, hospital departments and hospital out-patients clinics.*

4.4.2 Definition of the problem

There is considerable potential for both efficiency increases and savings on the cost of transferring patients to hospitals, but there is no doubt that the organisation of the service on the part of both the service provider and the service recipient has been inadequate. The medical/technical equipment has not been properly adapted, and accordingly the transfer of images between the hospitals is cumbersome.

4.4.3 Future plans

The overall objective of the Central Norway Health Network is to integrate existing and new connections and applications so that in the longer term all the region's institutions and activities have an outside connection to the health network. All projects will be included in the health network as well as e-mail, catalogue services and EDI.

Telesurgery is above all an aid in teaching and providing guidance in gastroscopy. The project was launched about one year ago. Equipment is in place at RiT, SMR, IHS and NDS. Some operations have been performed under direct guidance. The experience has been viewed as valuable and as a means of developing skills. The objectives of the project are quality assurance, diagnosis, teaching and technical discussions between the various medical communities. The intention is that all eight somatic hospitals in the region should join the project and that it should be a permanent arrangement.

Within telepathology the region hopes to establish a direct video link between all its somatic hospitals. The project should also offer scope for the inclusion of other consultative services and help to strengthen medical cooperation in the region. Links have been established between RiT and IHS and between RiT and NDS. The objective is to connect all hospitals to the project by the end of this year.

The teleradiology project was established in 1994 to secure rapid transmission of x-ray images from the hospitals in the region to RiT. Connections have been established between RiT and SMR and between RiT and IHS, and these hospitals are now able to print out transmitted digital x-ray images on laser printers for film. The objective of the project is to establish a network that encompasses all the hospitals in the region. A regional working party was set up in 1997, tasked with assessing the possibilities of PACS and RIS cooperation. The working party recommended the formulation of a joint functional specification for PACS and

and Renaldi (EMR) in Alameda county CT images to RTT for assessment in connection with
 technology. It is technically feasible to send any information available in digital form
 image level. All and appropriate images and some x-ray images, but RTT has to work
 station capable of accepting digital images. For images, detectors have to be able directly to
 a printer, which has limited capacity. The use of telemedicine suggests between 200K and 300
 has been limited. This is because of inadequate resolution in both ends. The best resolution
 hold monthly regional video conferences. The technology of EMR is part of a network
 telemedical teaching stations. Some of the hospitals in the region are part of a sub-network
 project involving the training of generalists by means of video.
 The regional health plan for Central Norway was adopted in 1982. Its financing
 standardized electronic messages for hospitals and doctors practices in the Central Norway
 Health Care Region, the region is aiming to reduce
 - 4 more comprehensive range of services involving telemedical and televisual cooperation
 between the first and second-line services
 - 2 Half-annual and quarterly cooperation between specialists in private practice, hospital
 department and hospital outpatient clinics

4.4.2 Definition of the problem

There is considerable potential for both efficiency increases and savings on the one hand
 transferring patients to hospitals, but there is no doubt that the organization of the services is
 the part of both the service provider and the service recipient has been inadequate. The
 medical/technical equipment has not been properly selected and accordingly the quality of
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4.4.3 Future plans

The overall objective of the Central Norway Health Network is to integrate existing and new
 connections and applications so that in the longer term all the regions' institutions and
 activities have an outside connection to the health network. All projects will be included in
 the health network as well as e-mail, catalogue, services and ERM.
 Technology is shown as an aid in teaching and supervising patients in radiology. The
 project was launched about one year ago. Equipment is in place at RTT, SMR, LRS and NPS.
 Some operations have been performed under direct guidance. The experience has been
 viewed as valuable and as a means of developing skills. The objective of the project is
 quality assurance, diagnosis, teaching and technical education between the various regional
 communities. The intention is that all eight medical hospitals in the region should join the
 project and that it should be a permanent arrangement.
 Within radiology, the region hopes to establish a center for all the regional
 hospitals. The project should also offer scope for the reduction of other consultant services
 and help to strengthen medical cooperation in the region. Links have been established
 between RTT and LRS and between LRS and NPS. The objective is to connect all hospitals in
 the project by the end of this year.
 The radiology project was established in 1986 to explore the possibilities of a new
 images from the hospitals in the region to RTT. Experiments have been carried out between
 RTT and SMR and between RTT and LRS and these hospitals are now able to print out
 transmitted digital x-ray images on laser printers for film. The objective of the project is to
 establish a network that encompasses all the hospitals in the region. A regional working party
 was set up in 1987, linked with existing telemedical services at RTT and LRS cooperation. The
 working party recommended the formation of a joint financial institution for LRS and

RIS. A decision was adopted in 1998 to include teleradiology, PACS and RIS in a joint project.

The Central Norway Health Care Region has adopted a decision to introduce standardised solutions for electronic message exchange. The EDI project will be completed so that in time EDI will become one of several services offered by the Central Norway Health Network. A number of sub-targets have been defined for this project:

Sub-target Phase 1, 1997-1998:

- The introduction of standardised messages for laboratory results (clinical chemistry, microbiology and radiography) between a number of practices and hospitals in each county.
- Planning the introduction of electronic communications for all message-based forms of communications (for example requisitioning and results for clinical chemistry, microbiology, radiography, medical notes, referrals).

Sub-target Phase 2, 1999-2000

- The introduction of standardised messages where appropriate.
- Planning the link to the Central Norway Health Network.

Sub-target Phase 3, 2001

- Establishing EDI as part of the Mid-Norway health network.

4.5 Northern Norway Health Care Region

Telemedicine in the Northern Norway Health Care Region is at a relatively advanced stage because the Regional Hospital in Tromsø has a telemedical department which has been designated as a competence centre for telemedicine. This section will focus on the region's views on the utility of telemedical measures.

4.5.1 Current status

All the somatic hospitals in the region, as well as a number of medical centres, are interconnected in the Northern Norway Health Network. This is structured as an intranet. The network is seen as part of a future Norwegian health network. It offers a number of services related to telemedicine and the adaptation of relevant information. The network is being built out gradually as required.

ENT teleconsultations have been conducted since 1992 between RiTø and Alta Health Centre. Consultations of this type are performed on a routine basis. The specialist, primary doctor and patient communicate by video conference and the patient is examined with the aid of an endoscope. Compressed and coded signals are sent over the ISDN network to a studio in Tromsø. Tele-consultations are conducted once or twice a month and involve seven or eight patients each time.

Teleconsultations within the field of dermatology have been conducted since 1989 between RiTø and Kirkenes Hospital. Teleconsultations to Hammerfest Hospital commenced in the autumn of 1996. The specialist, primary doctor and patient communicate via a video conferencing facility. Teleconsultations involving approximately 10 to 12 patients per transmission are held twice a week. Before the telemedical cooperation between RiTø and Kirkenes Hospital was introduced, the dermatologists travelled to Kirkenes Hospital six times a year where they attended patients from Eastern Finnmark. Waiting lists were long and patients needing immediate consultations would have to travel all the way to Tromsø. Since the introduction of weekly teleconsultations between the out-patients dermatology unit at Kirkenes Hospital and the Dermatology Department at RiTø, there have been no waiting lists in Eastern Finnmark and the need for emergency journeys to Tromsø has been reduced significantly. A phototherapy unit operated by a nurse has been established at Kirkenes and

- Establishing EDI as part of the Mid-Norway health network.
- Planning the link to the Central Norway Health Network.
- The introduction of standardized messages within systems.
- Sub-target Phase 2, 1999-2000
- Planning the introduction of electronic messages for all message-based forms of communication (for example radiology and results for clinical chemistry, microbiology, radiology, medical notes, etc.).
- Planning the introduction of electronic messages for all message-based forms of microbiology and radiology) between a number of practices and hospitals in each county.
- The introduction of standardized messages for laboratory results (clinical chemistry).
- Sub-target Phase 1, 1997-1998
- number of sub-targets have been defined for this project.
- EDI will become one of several services offered by the Central Norway Health Network. A
- The Central Norway Health Care Region has adopted a decision to introduce standardized
- project.
- EDI. A decision was adopted in 1998 to include technology, PACS and RIS in a joint

4.3 Northern Norway Health Care Region

Telemedicine in the Northern Norway Health Care Region is at a relatively advanced stage because the Regional Hospital in Troms has a telemedicine department which has been designated as a competence centre for education. This centre will focus on the region's views on the utility of telemedicine.

4.3.1 Current status

All the somatic hospitals in the region, as well as a number of medical centres, are interconnected in the Northern Norway Health Network. This is structured as an internal network to serve as part of a future health care network. It offers a number of services related to telemedicine and the alignment of telemedicine. The network is being built out gradually as reported.

ENT telemedicine has been conducted since 1991 between RITA and Aina Hospital Centre. Connections at this time are provided on a local basis. The system provides doctor and patient consultation by video conference and the patient is connected with the aid of an endoscopic equipment and control signals are sent over the ISDN network to a studio in Tromsø. Tele-consultations are conducted once or twice a month and involve around eight patients each time.

Telemedicine within the field of dermatology have been conducted since 1999 between RITA and Kaituma Hospital. The consultation is conducted in Hospital conducted in the autumn of 1999. The system provides primary, direct and indirect consultation via a video conference system. Telemedicine in the dental department is also conducted. RITA 13 provides an examination and has been a success. Before the telemedicine system, a patient had to travel to Kaituma Hospital and wait for the dentist's visit. Now, the patient can stay at home a year where they attend patients from Tromsø, Kaituma. Waiting lists were long and patients needing telemedicine consultations would have to travel all the way to Tromsø. Since the introduction of video telemedicine between the two patients' departments, the Kaituma Hospital and the Department of Dermatology in RITA, there have been no waiting lists in Tromsø. The need for emergency services for Tromsø has been reduced significantly. A methodology was reported by a survey has been published in Kaituma and

Hammerfest hospitals. The patients are examined with the aid of video conferences. 738 patients were diagnosed in 1997. As at June 1998, the figure was 328.

In 1990 the Department of Pathology and Anatomy at RiTø introduced a frozen section diagnostic service for Kirkenes Hospital. Harstad Hospital now offers the same service. This gives the individual hospital's own pathologists access to an operational frozen section service. 25 patients were diagnosed in 1997. As at June 1998, 14 patients had been diagnosed.

A telecardiology service between Kirkenes Hospital and RiTø was launched in 1992. 16 patients were diagnosed during 1997.

The X-Ray Department at RiTø is linked to all hospitals in the Northern Norway Health Care Region for teleradiological consultations. RiTø is used for as a reference for second opinions. Troms Military Hospital (TMS) uses the teleradiology service offered by RiTø more than any other hospital in the region. The hospital has no radiologist and for the most part does not take in patients in need of emergency assistance. During 1997 x-rays of 7,857 patients at Troms Military Hospital and 107 patients at other institutions were assessed by means of teleradiology.

Until recently telepsychiatry was synonymous with the use of video conferences for distance education and clinical services within psychiatry. Internet-based solutions as part of the concept of telepsychiatry are now increasing. Increasing attention will be focused on this as a means of offering distance learning and social support within mental health care. In 1997, 1,282 health personnel participated in these activities. Communications links have been in place between RiTø, Åsgård Psychiatric Hospital and Nordland Psychiatric Hospital.

4.5.2 The utility value of telemedicine

Northern Norway Health Care Region is geographically long and travelling can at times be difficult. Many of TMA's projects, particularly those that are now a part of regular operations, help patients to avoid strenuous journeys. Some telemedical services have resulted in reduced waiting times. In the longer term telemedicine could help to fulfil the national objective of providing equal access to health care irrespective of where the patient lives. Northern Norway Health Care Region is experiencing serious recruitment and instability problems in the primary health service. Telemedicine could help to ameliorate this situation because it allows specialist expertise to be made available to outlying districts and reduces professional isolation. The region is also hoping that its work on distance teaching and decentralised education will make it easier to retain and recruit medical personnel. It is particularly important to ensure that local candidates remain in the region.

The approach of Northern Norway Health Care Region to telemedicine is considered to be positive. Priority is given to flexibility and user friendliness, while at the same time experience and expertise of a more general nature are garnered which can also be used outside the health sector.

4.5.3 Future plans

A Northern Norway Health Care Region health plan is being prepared and a joint IT strategy for the region has been formulated. The future plans in this section are therefore based on TMA's areas of priority for the period 1999-2002. The Department will give priority to telemedical services in the home, networks for self-help, the development of services for the Norwegian Health Network, decentralised health education, telemedical information and advisory services, international cooperation and development and a laboratory dedicated to the telemedicine of the future.

Manitoba hospital. The patient was examined with the aid of video endoscopy. The patient was diagnosed in 1997. At June 1998, the figure was 212. In 1998 the Department of Pathology and Anatomy at RTH introduced a formal service for Kitchener Hospital. Kitchener Hospital now offers the same service. This gives the individual hospital's own pathologists access to an operational frozen section service. 25 patients were diagnosed in 1997. At June 1998, 14 patients had been diagnosed.

A telepathology service between Kitchener Hospital and RTH was launched in 1995. 18 patients were diagnosed during 1997. The X-Ray Department at RTH is linked to all hospitals in the Northern Norway Health Care Region for telepathological consultation. RTH is used as a reference for urgent opinions. Troms Miljøsykehus (TMS) uses the telepathology service offered by RTH more than any other hospital in the region. The hospital has no radiologist and for the most part does not take in patients in need of emergency assistance. During 1997, 1597 patients in Troms Miljøsykehus and 107 patients at other institutions were assessed by means of telepathology.

Until recently telepathology was synonymous with the use of video conferencing for discussion and clinical services within psychiatry. Patient-based solutions as part of the concept of telepsychiatry are now increasing. Increasing attention will be focused on this as a means of offering distance learning and social support within general health care. In 1997, 1382 health personnel participated in these activities. Consultations are taking place in place between RTH, Åsgård psychiatric hospital and Nordland Psychiatric Hospital.

4.2.5 The utility value of telemedicine

Northern Norway Health Care Region is geographically very and varying care is given in different parts of the region. Many of TMA's projects particularly those that are part of regular, continuing help patients to avoid strenuous journeys. Some telemedical services are needed at several varying times. In the longer term telemedicine could help to fulfil the national objective of providing equal access to health care irrespective of where the patient lives. In the Northern Norway Health Care Region is experiencing serious recruitment and retention problems in the primary health services. Telemedicine could help to alleviate this situation by using specialist expertise to be made available to outlying districts and reduce patient travel. The region is also hoping that its work on distance learning and telemedicine education will make it easier to train and recruit medical personnel. It is particularly important to ensure that local candidates remain in the region. The approach of Northern Norway Health Care Region to telemedicine is considered to be positive. Priority is given to feasibility and cost considerations, while at the same time experience and expertise of a more general nature are gathered which can also be used outside the health sector.

4.2.3 Future plans

A Northern Norway Health Care Region health plan is being prepared and a joint IT strategy for the region has been formulated. The future plans in this regard are dependent on TMA's work of priority for the period 1998-2001. The Department will give priority to telemedical services in the home, networks for telehealth, the development of services for the Norwegian Health Network, distance health education, telemedicine, information and advisory services, telemedical cooperation and development and a telemedicine laboratory in the telemedicine of the future.

4.6 Summing up

Telemedicine is used in varying degrees in all health care regions, thereby helping to give regional health cooperation a specific content. The regional level appears to be a manageable level as regard the introduction of telemedical methods. The region appears to be a suitable level both for creating an identity and for establishing constructive cooperation.

To sum up: it appears that telemedical methods are used to improve existing procedures and that as a result these procedures are performed in a more efficient way. A further characteristic feature of telemedicine use in the regions is that the level of involvement of the primary health service is low. The reason for this appears to be inadequate organisation on the part of the primary health service, lack of funding and the fact that communication links have so far primarily been established between hospitals. The involvement of the primary health service is an exception rather than the rule.

Not only are organisational and financial issues seen as barriers to the development of telemedicine, uncertainty also attaches to a number of legal issues relating to responsibility and rights in connection with telemedical methods.

A common feature of all regions is that there is great faith in the benefits of telemedicine, but very little documented effect. One example of this is that telemedicine is said to have a decentralising effect on patterns of dwelling in Norway. Although this may be the case, this has to be adequately documented.

5 How can the barriers be turned into incentives?

It is unlikely that technology imposes any restrictions on the sensible use of telemedical methods. The major challenges lie in achieving the best possible interplay between the various links in a chain comprising technology, user interfaces, the organisation of procedures and users. Too much attention has been focused on technology. It is therefore necessary to switch the focus towards adapting the technology, organisation and users. From a telemedical perspective this means that the health service must to a far greater extent than at present suit its day-to-day routines to communication with the relevant surroundings, and that personnel and resources must be allocated accordingly. At the same time much work remains to be done on developing technology, particularly the interfaces between the primary and specialist health services.

The individual subsections in the following must not be viewed in isolation: they are highly interdependent. Viewed individually they represent important approaches to ways in which the existing barriers to telemedicine might be turned into the incentives of tomorrow. However, for this to happen they must be viewed in context. For example, attitudes are important but they are not created in a vacuum, they are not changed free of context and they rarely function as agents of change on their own. It is important to establish fields in which new attitudes are supported by a visible and active management, where priority is given to the dissemination of expertise and new organisational procedures.

5.1 Technology

It appears that in the future customers will no longer purchase and establish their own networks, rather they will conclude an agreement and pay for the services offered by the

4.6 Summing up

Telemedicine is used in varying degrees in all health care systems, thereby helping to give regional health cooperation a specific content. The regional level appears to be a considerable level as regard the introduction of telemedical networks. The region appears to be a suitable level both for creating an identity and for establishing concrete inter-organizational cooperation. To sum up, it appears that telemedical methods are used to improve existing procedures and that as a result these procedures are performed in a more efficient way. A further characteristic feature of telemedicine and in the region is that the level of involvement of the primary health service is low. The reason for this appears to be inadequate organization on the part of the primary health service, lack of funding and the fact that municipalities have not so far primarily been concerned between hospitals. The involvement of the primary health service is an exception rather than the rule. Not only do organizational and financial factors seem to hinder the development of telemedicine, uncertainty also attaches to a number of legal issues relating to responsibility and rights in connection with telemedical methods. A common feature of all regions is that there is great faith in the benefits of telemedicine, but very little documented effect. One example of this is the telemedicine in and in Norway, demonstrating effect on patterns of working in Norway. Although this may be the case, this has to be adequately documented.

5 How can the barriers be turned into incentives?

It is unlikely that technology imposes any restrictions on the possible use of telemedical methods. The major challenge is in realizing the full possible benefits between the various links in a chain comprising technology, user attitudes, the organization of procedures and users. Too much attention has been focused on technology, it is therefore necessary to review the focus for and to change the technology, organization and users. From a technical perspective this means that the health service must to a far greater extent than at present use its day-to-day resources in communication with the relevant surroundings, and that personnel and resources must be allocated accordingly. At the same time much work has to be done on developing technology, particularly the interface between the primary and specialist health services. The individual solutions in the following must not be viewed in isolation; they are highly interdependent. Viewed individually they represent important opportunities to which the existing barriers to telemedicine might be turned into the successes of tomorrow. However, for this to happen they must be viewed in context. For example, training is important but they are not created in a vacuum, they are also changed by of context and they partly function as factors of change on their own. It is important to establish health in which new attitudes are engendered by a visible and active management, where priority is given to the dissemination of experience and new organizational procedures.

5.1 Technology

It appears that in the future customers will no longer purchase and own their own network, rather they will conclude an agreement and pay for it. Services offered by the

network supplier. This means that an agreement is concluded for a supplier to provide video conferencing services, EDI services, e-mail solutions, etc. and that an agreed price is paid. The requirements of the customer will define the bandwidth needed to supply the service. It will be up to the supplier to arrange for adequate bandwidth. The customer pays accordingly. Wireless links may prove to be an alternative to current technologies. Simple and reasonably priced "dishes" with speeds of up to 10 Mbits are now available. It is also possible that in future the cable network could be used for transmitting medical information. Although it is unlikely that the cost of basic network services will come down, there will be a considerable improvement in the relationship between price and performance.

5.2 Organisation

In a situation in which the health service is in part controlled by means of planning instruments (for example regional health plans) and in part through market mechanisms (free choice of hospital and funding based on treatment) IT and telemedicine will represent important means of ensuring that these various mechanisms pull in the same direction.

5.2.1 The organisational relationship between administrative levels

The organisational relationship between administrative levels involves ensuring that the general and overlying framework conditions reflect the required activity within the sector. Accordingly this is a question of general organisation of responsibilities and funding. The organisational relationship between the various agencies and their budgets does not satisfactorily reflect telemedical activity. Central government funding systems do not function in such a way that telecommunications between the specialist service and the primary health service are encouraged. The system today is such that the hospitals and the primary health service will be budgetary losers whereas the National Insurance Administration will benefit when telemedical methods replace journeys by patients to specialists.

5.2.2 Internal organisation

For the county municipal health service the introduction of telemedicine represents an organisational challenge. The extensive use of telemedical methods will for example entail the reorganisation of the available health services, from treatment in out-patients clinics to treatment in which the general practitioner plays a central role in communicating information between the patient and the specialist.³ The present duties and distribution of workload at an out-patients clinic will have to be adjusted if telemedical solutions are introduced to any great extent. Telemedicine uses the general practitioner as a representative or guide for the patient in his/her communications with the specialist. The direct relationship between doctor and patient will to some extent be challenged. This is a challenge for which the county municipalities as hospital owners must be prepared.

Taken to its logical conclusion one might say that the teaching of new technology will require a not inconsiderable element of unlearning of old technology. This is often more difficult than learning new working methods because old procedures are internalised and materialised in the organisation. Unlearning is also important because the new technology must not be used to digitalise the procedures of the past, but rather to establish new and more efficient methods of working.

This internal organisation or micro-organisation will be subject for examination by Forum for Organisational Development⁴ which is concerned with themes such as patient flow and

network supplier. This means that an agreement is concluded for a supplier to provide video
contracting services, HDI services, e-mail solutions, etc. and that an agreed price is paid.
The requirements of the customer will define the needs which need to be supplied by the service. It
will be up to the supplier to arrange for adequate hardware. The customer pays accordingly.
Wires have never to be an alternative to various technologies. Standards and technology
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choice of hospital and funding based on treatment) IT and telemedicine will represent
important means of ensuring that these various mechanisms pull in the same direction.

5.2.1 The organisational relationship between administrative levels

The organisational relationship between administrative levels is never simple and is
constantly changing. The relationship between the various levels is not the same in all
countries. Accordingly, this is a question of general organisation of care, medicine and health.
The organisational relationship between the various agencies and their budgets does not
necessarily reflect technical activity. Central government funding systems do not
function in such a way that technical innovation between the various services and the
primary health services are encouraged. The system today is such that the hospitals and the
primary health services will be budgetary losses whereas the National Institute
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in the organisation. Innovation is also important because the new technology does not fit
used to digitalise the procedures of the past but rather to establish new and more efficient
methods of working.
This internal organisation of multi-organisations will be important for the organisation of health care
Organisational Development which is concerned with the structure of the health care system.

internal cooperation processes within hospitals and between hospitals and the primary health service.

5.3 Competence

This section focuses on some key points relating to telemedicine and competence. Norway is a world leader in the development of new technology. However, the situation is by no means as rosy when it comes to introducing new technology and using it in routine operations. It is therefore important that the various players involved form part of a wider community of expertise of a regional, national and international nature. An obvious function for the Telemedical Department will be to act as a national and an international centre for communicating knowledge about telemedicine.

It is strategically important for managers⁵ to have skills in new technology so that organisations can be adapted in such a way that telemedical solutions can be introduced in an efficient way. Managers communicate important signals to their organisations about what constitutes useful, legitimate and desirable behaviour. It is therefore essential that management should be in possession of expertise about the new forms of organisation and technology.

The training of user groups therefore represents a challenge to which the highest priority must be given over the coming period. Moreover it is important that both the client (meaning the patient) and what we might term the server (the centrally located specialist) are in possession of sufficient expertise for the various persons involved in the telemedical communication to understand one another.

It is useful to distinguish between in-depth competence and the competence to order. In-depth competence will exist only in a relatively small number of groups with the necessary weight to engage in research and development. Competence to order, on the other hand, is something that a great many people will need. This means having sufficient expertise to find out about, formulate specifications for and make use of existing in-depth expertise.

One of the characteristic features of telemedicine is that centrally located competence is given a decentralised dimension. In a country such as Norway which is characterised by large distances and a widely spread population, a major challenge will lie in finding means of securing a decentralised, but satisfactory range of health services, even though competence is concentrated in major centres. Telemedical competence may represent a means of conquering geographical distance.

5.4 Funding

One of the chief problems associated with introducing telemedicine between the specialist and the primary health services is that the entrance ticket in the form of investments in equipment is viewed by the primary municipalities as relatively high. This acts as a barrier to the establishment of telemedical services in situations in which it would otherwise be (financially) efficient to do so. It must be an objective to ensure that the use of telemedical methods is reflected in the budgets of the individual parties concerned. The National Insurance Administration could perhaps reallocate its budget resources in line with the "savings" made in terms of lower refunds of patients' travelling expenses. Ideally reallocations of this type should benefit primary municipalities and primary doctors in the form of equipment investments and training in the use of new equipment.

One solution might be to organise the use of the equipment in such a way that it covers several functions and can thereby be used by a number of different groups.⁶ A further approach might be to use the funds that are saved on travel expenses on investments in

2.3 Competence

This section focuses on some key points relating to technology and competence. Norway is a world leader in the development of new technology. However, the situation is not as rosy as it seems in introducing new technology and using it in various operations. It is therefore important that the various players involved form part of a wider community of expertise at a regional, national and international level. An obvious focus for the Norwegian Government will be to set up national and an international centre for disseminating information about technology.

It is strategically important for managers to have skills in new technology so that organisations can be adapted in such a way that technical solutions can be introduced in an efficient way. Although competence is important to organisations, it is not always clear what constitutes useful, technical and domain-specific skills. It is therefore essential that management should be in possession of expertise about the new forms of organisation and technology.

The training of new groups for their operations is a challenge in which the highest priority must be given over the existing group. However, it is necessary to have both the right human resources and what we might term the correct (the currently best) technical solution for the organisation to be successful. The various groups involved in the technical organisation should understand one another.

It is useful to distinguish between in-built competence and the competence to learn. In-built competence will exist only in a relatively small number of groups with the necessary will to engage in research and development. Competence to learn, on the other hand, is a learning that a great many people will need. This means having sufficient expertise to find out about, describe and disseminate for and make use of existing in-built expertise.

One of the characteristics of technology is that expertise is often located in groups and is given a decentralised structure. In a company, this is a key factor which is characterised by large distances and a widely spread population. A major challenge will be to reduce the distance between a decentralised, but somewhat large, in-built expertise and a centralised, but somewhat small, competence to learn. This requires a centralised, but somewhat small, geographical distance.

2.4 Funding

One of the chief problems associated with introducing technology between organisations is that the primary problem is that the general belief in the value of the equipment is viewed by the primary management as either high or low. This view is a result of the establishment of technical services in industries in which it would otherwise be (financially) difficult to do so. It must be an objective to ensure that the use of technical methods is reflected in the business of the industry and, if necessary, to work with the industry. An important goal is to ensure that the technical services are seen as a 'value-added' activity in terms of some technical business process, especially if the introduction of the new technology creates employment and thereby reduces the loss of equipment investment and thereby in the use of new equipment.

One solution might be to view the use of the equipment in such a way that it covers several functions and can thereby be used for a range of different groups. Another approach might be to see the value that the service can provide to an organisation in

equipment and training in the primary health service.⁷ This could for example be done by "freezing" the money in a fund earmarked for municipal investments in IT equipment. Telemedicine must be funded from a variety of sources. The institutions involved should all take part in funding. In addition to basic finance through operational grants and hospital grants, consideration should be given to imposing requirements on the recipients. Financial incentives such as different rates in connection with the performance of clinical duties should be a means of stimulating the use of telemedicine.

5.5 Attitudes, knowledge, roles and habits

The use of telemedical methods will to some extent mean that the traditional roles of health personnel will change. Some of the areas in which the specialist, general practitioner and nurse work will be redefined. From a traditional perspective it may look as though the role of the specialist will be downgraded whereas the general practitioner and nurse may perceive that their roles have been upgraded. Telemedical methods create a new and unfamiliar work situation for the users. The situation represents a break with the traditional direct, hierarchical relationship between doctor and patient. The use of telemedicine changes the roles of the professions.

Where a patient has been referred to a specialist and telemedical methods are used, the role of the general practitioner will be more that of a guide or representative during the meeting between the patient and specialist. The specialist in turn may find that he/she has greater capacity to take on the referred patients.⁸ This development may also entail that in future nurses perform duties traditionally associated with doctors.

This section has a number of points in common with section 5.2 which discusses organisation. The message is the same: changing an organisation and introducing new technology takes time. This has to do with the nature of an organisation's structure and the roles and routines of the personnel who populate the organisation.

It is known that the introduction of new technology may affect the role of the patient. The use of telemedicine increases the physical distance between the care provider and the patient. As a result, the relationship between patient and carer may change. Both patient and care provider will have to relate to new technology with which they may or not be familiar. Telepsychiatry, for example, may entail that a patient opens up more than during traditional treatment. This may be beneficial, but there is also a danger that the patient may open up more than is desirable. It is therefore essential that the patient should feel safe in his/her new role. The working party wishes to stress that where telemedicine is used, it is essential that patients be provided with satisfactory information.

5.6 Legal challenges

There are a number of legal challenges associated with the use of telemedicine. At present legal responsibilities are defined in a circular on telemedicine and responsibilities issued by the Ministry (Circular I-5/96). In telemedicine the term "primary doctor" is applied to the attending doctor even though he/she may be a specialist at a different hospital. The Doctors Act provides that doctors are required to exercise their calling in a satisfactory manner and do their best to provide patients with expert and considerate help. When telemedicine is used the primary doctor and the specialist must both, to a greater extent than otherwise, ensure that the available information is sufficient for them to give a satisfactory diagnosis and/or implement satisfactory treatment. This is necessary because of the technological limitations. The specialist must also exercise due care as regard the information acquired through the interpretations of the primary doctor. It is a widely known phenomena that information

equipment and training in the primary health services. This could be done by "leasing" the money in a form acceptable for financial investment in IT equipment. Technicians must be trained from a variety of sources. The institutions involved should all take part in training. In addition to basic health training, specialized training and hospital grants, course writers should be given to improve requirements on the technical front. Incentives such as different rates of consultation with the performance of clinical duties should be a means of stimulating the use of telemedicine.

2.5 Attitudes, knowledge, roles and habits

The use of telemedical methods will to some extent mean that the traditional roles of health personnel will change. Some of the areas in which the specialist, general practitioner and nurse work will be combined with a traditional practitioner is only one, though the role of the specialist will be downgraded whereas the general practitioner and nurse may expand. Telemedical methods require a new and distinctive role. The question of how to deal with the traditional doctor, however, is a question for the future. The question of how to deal with the traditional doctor, however, is a question for the future. The question of how to deal with the traditional doctor, however, is a question for the future.

When a patient has been referred to a specialist and telemedical methods are used, the role of the general practitioner will be that of a guide or supervisor. The specialist is now free to do his greatest work between the patient and practice. The specialist is now free to do his greatest work between the patient and practice. The specialist is now free to do his greatest work between the patient and practice. The specialist is now free to do his greatest work between the patient and practice.

This section has a number of points in common with section 2.4 which discuss organization. The message is the same: change in organization and technology are necessary for the use of telemedicine. This has to do with the nature of an organization's structure and the roles and relations of the personnel who compose the organization.

It is known that the introduction of new technology may affect the role of the patient. The use of telemedicine increases the patient's control over his care provider and the patient's role. The relationship between patient and care provider may change. The patient and care provider will have to relate to new technology with which they may or not be familiar. Telemedicine, for example, may entail that a patient should be more than a passive recipient of treatment. This may be beneficial, but there is also a danger that a patient may overstep more than is desirable. It is therefore essential that the general should feel safe in his or her role. The working party wishes to stress that when telemedicine is used, it is essential that patients be provided with satisfactory information.

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deteriorates for each stage through which it passes. This is particularly important in the case of telemedicine because it serves to reduce the legal grey area in which the distribution of responsibility may appear unclear.⁹

The various telemedical methods are so different that it is difficult to provide any general legal evaluation. Further assessment will be required in each individual case. It is therefore essential that the legal challenges associated with telemedical methods be acknowledged. The Ministry is providing support for a project at the Telemedical Department at Tromsø examining the legal issues associated with the use of telemedicine. The primary objective of the project is to provide quality assurance with regard to telemedical practice in areas associated with legal problems.

6 Assessments and recommendations

6.1 Medical utility value

The following section discusses the utility of telemedical methods that can be put into regular day-to-day operations and those solutions that require further development. By way of introduction some comments will be provided on the beneficial effects of telecommunications as used in what is defined as telemedicine.

Information technology and telemedicine are complementary elements in relation to a physical meeting places. New technology can never entirely replace direct contact between people, although it may in many instances represent an alternative and a supplement which contribute to a more efficient use of resources in the health service.

Two points in particular should be noted as regards the relationship between the specialist health service and the primary health service. One of these is the transfer of expertise which takes place when the specialist and the general practitioner are in regular communication in this way. The second factor relates to the important contribution that telemedicine can make to breaking down the sense of professional isolation felt by health personnel working in smaller municipalities. Professional isolation has been suggested as one reason why it is difficult to maintain stability and recruitment in health posts in smaller, outlying municipalities.

6.1.1 Services that can be put into regular operation

Video conferencing is a two-way sound and picture link that can be used for all types of meetings in which a visual element is required in addition to sound transmission. The participants are separated geographically but can nevertheless see and hear one another. Video conferencing involves two or more studios, and is both national and international. Video conferences are used for educational purposes and for diagnosis and treatment. Distance education is used on a routine basis as a means of providing decentralised education. However, there is scope for a far greater degree of coordination of the service than is the case at present. The development of a coordinating function for distance education in health subjects is something to which priority should be given in the future.

Telemedicine is used in ENT consultations. The outcome of this type of examination will in the majority of ENT complaints be equivalent to an ordinary ENT examination. Patients are happy to have access to this service in their home locality. This type of telemedicine has proved to be very cost effective in cases in which the patient base exceeds 56 patients per

...of telemedicine because it serves to reduce the legal grey area in which the determination of responsibility may appear uncertain.

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6 Assessments and recommendations

6.1 Medical utility value

The following section discusses the utility of telemedical methods that can be put into regular day-to-day operations and their solutions for remote patient development. By way of introduction some comments will be provided on the potential effects of teleconsultations as used in what is defined as telemedicine.

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6.1.1 Services that can be put into regular operation

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Telemedicine is used in five conditions. The essence of this type of education will be the majority of ERM countries be given access to an ordinary ERM examination. Patients are happy to have access to the service in their home health. The type of telemedicine that proved to be very cost effective in cases in which the patient has to travel a long way

year. This is when the transmission of knowledge from the specialist to the general practitioner is taken into account (Bergmo 1997).¹⁰

Telepathology within frozen section diagnosis is regarded as a medically satisfactory service on a par with traditional pathology. The service is not extensive but it has been well received by the patients and in technological terms it is sufficiently well developed to form part of regular health services. This type of service is particularly useful to hospitals without operational pathological departments and for securing second opinions on frozen sections. Telecardiology using Doppler Echo cardiography of the heart is in regular use. Patients can be examined at their local hospital and the examination of the heart can be transmitted by means of a video conferencing system to a specialist at a larger hospital. The cardiologist checks the examination, findings and treatment programme. The results of this type of examination have shown that in the case of many types of heart complaint it is possible to provide patients with the necessary specialist expertise, even if they are located in their own local hospital. Telecardiology is also used for second opinions, guidance and teaching. Smaller hospitals may have equipment that is not used because the hospital has no cardiologist. If over-the-shoulder assistance via video conference is used, the doctors are able to use the equipment themselves.

Teleradiology has considerable potential as a routine procedure. The method can be used both in the ordinary way and for second opinions.¹¹ In the case of hospitals without a radiologist and few or no acute patients, this represents a real improvement in the services offered. In teleradiological consultations hospitals with dedicated telemedical workstation in their x-ray department transfer images to an equivalent work station at the recipient x-ray department. Ideally this system should be in direct electronic communication with the hospital's radiographic information system (RIS). A system of this type structures the personnel, so that the process of external x-ray examinations is entirely equivalent to in-house x-ray examinations at the hospital. External examinations are therefore not perceived as extraordinary by the personnel. The radiologist's response is entered in the information system without delay and will thereafter be available to the requisitioning hospital via the dedicated work station in the x-ray department.

Teledermatology is already used in routine services and the quality of the images is considered to be such that the technical basis for the diagnosis is good. This service requires relatively little investment in equipment and involves a real improvement in the services offered to the patient.

6.1.2 Areas for development

Telemedical technology is a new technology and is still in its innovatory phase. This technology therefore requires testing and the development of expertise. Areas in which telemedicine is sufficiently well developed to be used in regular medical services must not be ignored when it comes to development. Technology is developing so rapidly that there will be an ever-present need to continue to develop existing well developed services.

Development projects are therefore under way on the methods described above. Both within teledermatology and teleendoscopy for ENT trials are under way to ascertain whether still pictures can be used as the basis for diagnosis. If the outcome is positive, this will allow pictures to be sent as attachments to e-mail to specialists who will then be able to assess the pictures at an appropriate juncture. This would make the available telemedical services more flexible. Both video conferencing and still picture technology could be used. Still picture technology is less costly than video conferencing equipment and will in the majority of cases provide a sufficient basis for the specialist to give a diagnosis.

year. This is when the construction of hospitals to house the specialists in the general
practitioner is being completed (1997/10)
Laboratory within these sections is regarded as a mainly laboratory service
on a par with traditional pathology. This service is not extensive but it has been well received
by the patients and in technological terms it is well served. It will be developed to bring it on
regular health service. The type of service is particularly needed to provide without
operational pathological departments and for certain special services on lower floors.
Laboratory using today's technology at the heart is to regular the. Patients can
be examined at their local hospital and the examination of the heart can be managed by
means of a video conferencing system to a specialist at a larger hospital. The cardiology
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local hospital. Telecardiology is also used for second opinion, guidance and teaching.
Smaller hospitals may have equipment that is not used because the hospital has no
cardiologist. It over the specialist treatment services provided is used, the doctors are able
to use the equipment themselves.
Telemedicine has considerable potential as a service. The method can be used
in the ordinary way and for several reasons. In the case of patients without a physician
and few or no acute patients, the equipment is not used. In the service of the
telecardiology conditions hospitals with dedicated telecardiology facilities to their own
department transfer images to an equivalent work station at the receiving hospital.
Ideally this system should be in direct electronic communication with the hospital.
Telecardiology network system (TLC) A system of this type structure the network, so that
the process of external video examination is relatively easy than in the case of a
examination at the hospital. External examinations are therefore not performed as
examination by the network. The radiology's network is used in the network.
system without delay and will demonstrate the ability to the telemedicine hospital and the
dedicated work station in the hospital department.
Telemedicine is clearly used to monitor services and the quality of the service is
considered to be such that the technical basis for the diagnosis is good. The service is
relatively high investment in equipment and training a real improvement in the service
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flexible. Both video conferencing and still picture technology could be used. The service
technology is less costly than video conferencing and equipment and will in the majority of cases
provide a sufficient basis for the specialist to give a diagnosis.

Trials have been conducted in which pathological sections have been digitally photographed and sent as e-mail attachments. The conclusion is that this method of securing a second opinion is good enough for many pathological complaints. This work can be continued in a national pathology network for discussion, second opinion and teaching.

The examination of patients with diabetes-induced retinal complaints normally requires the patient to travel to the specialist. RiTø is conducting an investigation into the suitability of remote diagnosis of this type of complaint. Trials have been conducted using a fundus camera with black and white/and colour pictures and the digital transmission of these pictures. This service could be put into regular operations if the quality is sufficiently high.

Until recently telepsychiatry was synonymous with the use of video conferencing in distance education and clinical services within psychiatry.

Internet based solutions as part of the concept of telepsychiatry are now increasing.

Increasing attention will be focused on this as a means of offering distance learning and social support within mental health care. This is an area which will be suitable for regular operations subject to further development and coordination of the service.

It is important that new solutions be tested on well-established services at the same time as research is conducted into entirely new methods. Telemedicine can be used for emergency purposes and as a decision-making tool in emergency aid situations. At the same time technological development will open up new areas of application. It is important that both patient and health personnel be borne in mind in this development. How do they perceive the use of telemedical methods? This is an area on which little work has been done to date although the investigations that have been conducted show that by and large patients are satisfied with telemedical consultations (Pedersen and Holand 1995; Holtan 1996).

of telemedicine

6.2 Health-economic and socio-economic consequences

This section assumes that the medical quality of ordinary medical methods and of telemedical methods within those disciplines in which telemedicine is used is equal.

It should be noted that there are considerable gains to be made by standardising communications within the health service. The development of standards for use in the health service is an important area to which priority is given, inter alia in the standardisation programme, KITH and TMA.

6.2.1 When do telemedical methods represent a rational choice?

Health-economics analyses reveal that telemedical methods are efficient with a given population base.¹² The size of the patient population will to a great extent determine whether using telemedicine is more profitable than for patients to travel to a specialist or for a travelling specialist to visit a hospital a certain number of times during the year. In the case of services such as teleradiology, teledermatology and telediagnosis in connection with ENT, investigations have shown that telemedical methods are profitable when compared with patients travelling to a specialist or the specialist travelling to the patient. The operating costs of telemedicine will depend on whether the service is provided on-line (as a video conference) or off-line (still picture as attachments to e-mail).

The cost of still picture solutions is considerably lower than a video conference solution, which in turn is less costly than patient travel. The cost of travelling specialists and video conferencing are more or less the same. A combination of video conference and still picture technology will cover most types of consultation. Where telemedicine is able to provide a service that is medically satisfactory, this will represent a cost-effective method when compared with alternatives such as travelling specialists and patients visiting the specialist. It

Trials have been conducted in which pathological sections have been digitally photographed and sent as e-mail attachments. The conclusion is that this method of secure e-mail and scan is good enough for many pathological complaints. This work can be extended to a national pathology network for discussion, second opinion and teaching. The examination of patients with disease-induced renal complaints normally requires the patient to travel to the specialist. With e-mail conducting an investigation into the suitability of remote diagnosis of this type of complaint. Trials have been conducted using a similar system with black and white and color pictures and the digital transmission of these pictures. This service could be put into regular operation if the quality is sufficiently high. Until recently telepathology was synonymous with the use of video conferencing in diagnosis, education and clinical research within pathology.

Internet based solutions as part of the concept of telepsychiatry are now increasing. Increasing attention will be focused on this as a means of offering distance learning and social support within mental health care. This is an area which will be suitable for regular operations subject to further development and coordination of the service. It is important that new solutions be tested on well-established services at the same time as research is conducted into entirely new methods. Telemedicine can be used for emergency purposes and as a decision-making tool in emergency and situations. At the same time technological development will open up new areas of application. It is important that both patient and health personnel be kept in mind in this development. How do they perceive the use of telemedical methods? This is an area on which little work has been done to date although the investigations that have been conducted show that by and large patients are satisfied with telemedical consultations (Petersen and Holm 1995; Holm 1995).

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is important to note that this is the situation as it exists at present and that the future will bring cheaper technology but that personnel costs will probably be higher. The calculations serve to illustrate that telemedical methods represent a more efficient use of the resources available to health personnel. Telemedicine improves the availability of health services to the population and this is medically defensible. The economic studies that have been performed give a favourable impression of telemedicine when compared with visiting specialists and patients travelling to specialist. However, relatively few studies have been conducted and the selection is fairly limited. The effects on the health economy has therefore not been adequately documented, merely suggested.

As yet the socio-economic consequences of telemedicine are not known. This is related to the relatively short space of time that telemedicine has been in use and because the available data is too slim for unambiguous conclusions to be drawn. Nonetheless, the socio-economic consequences can be suggested on the basis of those projects that have been performed.

In many cases the use of telemedicine will reduce the disadvantage to the patient of travelling. Where a patient has to travel, his/her absence from work will be longer than would be the case had the patient been able to receive a consultation without travelling. It is possible that this will result in higher productivity and greater stability in the work force. There is no doubt that there are savings to be made by using telemedical methods, but it is not known how great these savings might be.

6.3 The consequences for regional policy of increased use of telemedicine

The regional effects of telemedicine are not unambiguous. Although from the perspective of regional policy the technology on which telemedicine is based is neutral, it may represent a tool that will serve to strengthen outlying districts by:

- Increasing the health services available to people in the regions, in particular by increasing their access to specialist expertise.
- Increasing the opportunities for general practitioners to enhance their expertise.
- Reducing the feeling of professional isolation felt by primary doctors.
- Increasing the health-related teaching services available in the regions.
- Creating a base for businesses activities related to health services and the development of technology.

On the other hand telemedicine may increase regional differences because:

- The weakest and most peripheral municipalities lack the necessary resources (finance, expertise and motivators) to use the technology.
- There will be differences between municipalities and hospitals depending on the degree to which they are able to put the new technology to use.
- Some forms of infrastructure are not equally available in all regions.
- The telemedical expertise will be concentrated in institutions in the towns and this will serve to strengthen the shift towards centralisation.
- Many patient groups, particularly in the regions, will be unwilling or unable to use the new technology.

Telemedicine serves to reduce the disadvantage that distance represents to patients. It gives patients access to treatment which would not otherwise be available to them or which they would have to travel a long way to receive or which a specialist would have to travel a long way to provide. The measures launched by the Ministry of Health and Social Affairs to provide all inhabitants of the country with the best health services available irrespective of

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- Increasing the opportunities for general practitioners to enhance their expertise.
- Reducing the technology-induced isolation felt by primary doctors.
- Increasing the health-related technology services available in the region.
- Creating a base for business activities related to health services and the development of technology.
- On the other hand telemedicine may increase regional differences because:
 - The workers and those professional municipalities lack the necessary resources (financial, expertise and motivation) to use the technology.
 - There will be differences between municipalities and hospitals depending on the degree to which they are able to use the new technology to use.
 - Some forms of infrastructure are not equally available in all regions.
 - The telemedical expertise will be concentrated in institutions in the towns and the will serve to strengthen the pull towards centralisation.
- Many national groups, particularly in the region, will be unwilling or unable to use the new technology.
- Telemedical services to reduce the health status that distance represents to patients. It gives patients access to treatment which would not otherwise be available to them or which they would have to travel a long way to receive or which a specialist would have to travel a long way to provide. The pressure imposed by the Ministry of Health and Social Affairs to provide all inhabitants of the country with the best health services available, irrespective of

where they live will become part of the wider regional policy. As such these measures are important to the population patterns in the country. The consequences of telemedicine for regional policy lie within the triangle defined by what is technologically possible, economically profitable and medically desirable. Public policy must be concentrated in this space. Focusing on this area will enable public policy to be used to help ensure that development moves in the desired direction. A general contribution can be found in the signals given in Report No. 38 to the Storting (1997/98) in which the Government states that it will apply an offensive strategy in order to encourage the development of IT expertise in all regions to enable the country as a whole to utilise IT solutions. As regards regional policy, this general policy can be summed up in the following points:

- The establishment of a scheme to encourage public sector enterprises to introduce services based on infrastructures for high speed communication.
- The implementation of and support for pilot projects to stimulate new uses for information networks with a particular emphasis on regional and municipal networks, telemedicine and distance learning.
- New central government functions should be located outside Oslo and preferably in the regions. Any exceptions to this principle require special reasons.

The effects of technology development may be negative, particularly if development is left entirely to the market. The development of high speed lines represents a major investment when compared with the cost of laying ISDN lines which are adequate for a range of telemedical services, but slower than high speed lines. In the longer term this could make it more difficult to establish telemedical services in more peripheral areas of the country. It will not be profitable for commercial players to develop widely distributed networks in low population areas. Areas with scattered populations will therefore have to make do with ISDN lines. Given the direction in which technology is moving, this must be viewed as a disadvantage in the longer term. The conclusion is therefore that place of residence will to a large extent determine the health services available to citizens. This kind of difference in service availability may be politically unacceptable.

It is unlikely that infrastructure will of itself represent a barrier to the development of telemedical services at regional and district level. In terms of regional policy the weakest municipalities can be encouraged to introduce telemedicine in order to be able to offer their citizens the same medical services as are available in more centrally located municipalities. Suitable means in this regard might be training and regional competence development, support for equipment for the poorest municipalities and the development of networks. It is important that telecommunication be supplemented by procedures for cooperation, including physical meetings, observation schemes, the organisation of competence pools, further education and specialist training. Strategic alliances of this nature should be established, preferably at regional level.

Technology is neutral from the perspective of regional policy. Nevertheless the way in which technology is combined with other tools will have consequences for regional policy. It is not known whether these consequences will have a centralising or decentralising effect. It is therefore important to conduct a continuous debate and research into the effects of telemedical development on health policy and regional policy in order to influence the development of needs and to prioritise measures.

where they live will become part of the wider regional policy. As such these regions are important to the population patterns in the country. The consequences of regional policy for regional policy are within the triangle defined by what is technologically possible, economically profitable and medically desirable. Public policy must be concerned in this space. Focus on this area will enable public policy to be used to help create that development moves in the desired direction. A general contribution can be found in the signals given in Report No. 38 to the Steering (1992) in which the Government states that it will apply an offensive strategy in order to encourage the development of IT expertise in all regions to enable the country as a whole to utilize IT solutions. As regional regional policy, the general policy can be summed up in the following points:

- The establishment of a scheme to encourage public sector enterprises to introduce services based on infrastructure for high speed communication.
- The implementation of and support for pilot projects to stimulate new uses for information networks with a particular emphasis on regional and municipal networks, telemedicine and distance learning.

- New central government functions should be located outside Oslo and preferably in the regions. Any exceptions to this principle require special reasons. The effects of technology development may be negative, particularly if development is left entirely to the market. The development of high speed lines represents a major investment when compared with the cost of laying ISDN lines which are adequate for a range of telemedical services, but slower than high speed lines. In the longer term this could make it more difficult to establish telemedical services in more peripheral areas of the country. It will not be profitable for commercial players to develop widely distributed networks in low population areas. Areas with scattered populations will therefore have to make do with ISDN lines. Given the direction in which technology is moving, this must be viewed as a disadvantage in the longer term. The conclusion is therefore that place of residence will to a large extent determine the health services available to citizens. This kind of difference in service availability may be politically unacceptable.

It is unlikely that investments will of itself represent a barrier to the development of telemedical services at regional and district level. In terms of regional policy the western municipalities can be encouraged to introduce telemedicine in order to be able to offer their citizens the same medical services as are available in more centrally located municipalities. Suitable means in this regard might be training and regional components development, support for equipment for the poorer municipalities and the development of networks. It is important that telecommunication be supplemented by procedures for cooperation including physical meetings, observation schemes, the organization of consensus groups, further education and specialist training. Strategic alliances of this nature should be established, preferably at regional level.

Technology is neutral from the perspective of regional policy. Nevertheless the way in which technology is combined with other tools will have consequences for regional policy. It is not known whether these consequences will have a centralising or decentralising effect. It is therefore important to conduct a continuous debate and research into the effects of telemedical development on health policy and regional policy in order to influence the development of costs and to practice measures.

6.4 Industrial and commercial aspects of increased use of telemedicine

The health market is attractive to business and industry for a variety of reasons. The market is extensive and growing, both internationally and in Norway. Annual purchases of goods and services for the Norwegian health market are estimated to be in the region of NOK 20 billion kroner. To this must be added considerable future investments in new hospitals and new buildings as well as investments in specific projects. The health sector is also in possession of extensive expertise of use to the commercial sector. This will make it easier for business and industry to satisfy the acquisition requirements of the sector.

The Ministry of Trade and Industry in cooperation with the Ministry of Health and Social Affairs has for some years encouraged commercial development within the health sector. Within the of area technical aids for the disabled, the results have been very favourable. Norwegian manufacturers now have a considerably higher proportion of equipment deliveries than in the past. The main explanation for this is that the market is dominated by a single major bulk-buying customer, i.e. the National Insurance Administration.

At present the sector is characterised by fragmented and small communities which offer business and industry few incentives to inject extensive resources. There is still little coordination of purchasing in the health sector. This is probably one of the reasons why so few Norwegian companies find this market attractive. However, interest is increasing amongst both major international corporations and small relatively newly established companies. The Ministry of Trade and Industry and the Ministry of Health and Social Affairs have jointly set up a National Centre for Innovation and Commercial Development in the Health Sector. The rationale behind establishing a centre of this nature is to encourage active cooperation between the health sector and Norwegian business and industry with a view to developing and commercialising better products and services for the health sector, both nationally and internationally. The centre is operated by SINTEF Unimed, with local coordinators in each of the five health care regions. These are Medinova in Oslo, Innovest in Bergen and NORUT Medisin og Helse in Tromsø. NORUT Medisin og Helse will have overall responsibility for telemedicine within the centre. Cooperation has been established with the Telemedical Department at RiTø with a view to enabling NORUT to commercialise ideas and expertise generated at the Department.

As regards IT solutions in general, development is rapid. It is therefore difficult to predict what the health market will look like in five to ten years time. Information both from companies and from the health sector as well as technology scenarios for the future suggest that there is considerable potential for improving efficiency by using digital equipment in the health sector. Increasing cooperation between health institutions and the fact that each individual doctor will in future have a PC at his/her disposal suggests that the IT market will be extensive, as do developments within communications and the Internet.

Increased investment in telemedicine and the development of a national health network could have widespread beneficial consequences for business and industry. Areas that will be widely effected by such an investment are suppliers of telecom services in telecommunications networks or via satellites, manufacturers of various types of equipment and software, and consultants who are able to develop and sell specialist expertise within telemedicine, in an international market. Furthermore, expertise developed within telemedicine may have spin-off effects for other industries and other sectors.

The ability to use information technology will to a large extent be decisive as regards population stability and wealth creation throughout the country. Report No. 38 to the Storting outlines measures for strengthening IT expertise throughout the country by promoting regional IT communities, increasing educational capacity and encouraging closer interplay

6.4 Industrial and commercial aspects of increased use of telemedicine

The health market is attractive to business and industry for a variety of reasons. The market is extensive and growing both internationally and in Norway. Annual purchases of goods and services for the Norwegian health market are estimated to be in the region of NOK 10 billion. To this must be added considerable future investments in new hospitals and new buildings as well as investments in specific projects. The health sector is also in possession of extensive expertise of use in the commercial sector. This will make it easier for business and industry to carry out acquisition requirements of the sector.

The Ministry of Trade and Industry in cooperation with the Ministry of Health and Social Affairs has for some years encouraged commercial development within the health sector. Within the area mentioned here for the disabled, the results have been very favourable. Norwegian manufacturers have made a considerably higher proportion of equipment deliveries than in the past. The main explanation for this is that the market is dominated by a single major buying customer, i.e. the National Insurance Administration.

At present the sector is characterised by fragmented and small communities which offer business and industry few incentives to inject extensive resources. There is still little coordination of purchasing in the health sector. This is probably one of the reasons why few Norwegian companies had the market success. However, interest is increasing amongst both major international corporations and small relatively newly established

companies. The Ministry of Trade and Industry and the Ministry of Health and Social Affairs have jointly set up a National Centre for Innovation and Commercial Development in the Health Sector. The rationale behind establishing a centre of this nature is to encourage more cooperation between the health sector and Norwegian business and industry with a view to

developing and commercialising better products and services for the health sector, both nationally and internationally. The centre is operated by SINTEF (National) with local coordinators in each of the five health care regions. These are Mid-Norway, Ost, Southern, Eastern and NORUT. NORUT (North) is the only one of the centres which has been established with the Telemedicine Department at SINTEF with a view to enabling NORUT to commercialise ideas and expertise generated at the Department.

As regards IT solutions in general, development is rapid. It is therefore difficult to predict what the health market will look like in five to ten years time. Information technology comes and from the health sector as well as technology experience for the future is that there is considerable potential for improving efficiency by using digital equipment in the health sector. Increasing cooperation between health institutions and the fact that each individual doctor will in future have a PC at his/her disposal suggests that the IT market will be extensive as do developments within communications and the internet.

Increased investment in telemedicine and the development of a national health network could have widespread beneficial consequences for business and industry. Areas that will be widely affected by such an investment are suppliers of telecost services in telecommunications networks via satellite, manufacturers of various types of equipment and software and consultants who are able to develop and sell specialist expertise within telemedicine in an international market. Furthermore, expertise developed within telemedicine may have spin-off effects for other industries and other sectors.

The ability to use information technology will to a large extent be decisive as regards population stability and wealth creation throughout the country. Rapid development in the following outlines measures for strengthening IT expertise throughout the country by promoting regional IT communities, increasing educational capacity and encouraging closer contacts

between research and educational communities and business and industry. The development of regional competence centres for IT such as a telemedical centre in Tromsø could have a major impact on the establishment of regional business communities. Accordingly, it will also have a positive effect viewed from the perspective of regional policy.

As a follow-up to Report No. 38 to the Storting and the Information Technology Plan for Industry from 1998 to 2001 the 1999 budget contained appropriations in the region of NOK 170 million aimed at strengthening IT. Areas of particular interest as regards telemedicine included:

- The establishment of a scheme of product development grants totalling NOK 100 million spread out over four years to be administered by the Industrial and Regional Development Fund's district office in Trondheim. The goal is to make it easier for scientists and innovators to commercialise research results and good product ideas.
- The establishment of an incentive scheme for public and quasi-public enterprises. This is designed to stimulate a more user-friendly and efficient public administration through the use of services operating in a high-speed networks. The objective is to secure both commercial and administrative development and the framework for the scheme for 1999 totals NOK 18 million. The scheme can be used to strengthen and develop the public sector services offered within, for example, telemedicine.
- The establishment of a national microtechnology programme totalling NOK 25 million. The funds are largely intended to contribute to the strengthening of scientific communities in Trondheim and Oslo, and to promote industrial development in the field.
- An increase in the grant to the National Information Network (NIN) of NOK 10 million to NOK 40 million. This to stimulate the development of regional information networks and pilot projects in telemedicine, distance education and telecommuting.
- The strengthening of telecommunications research by NOK 6 million in 1999 to NOK 36 million.

Other suitable sources of funding include the Information Technology in Medicine and Health programme organised by the Norwegian Research Council and public research and development contracts (OFU contracts) organised by the Norwegian Industrial and Regional Development Fund. The OFU Scheme has earmarked NOK 13 million for health projects in 1999. There are also a number of other funding schemes organised by both the Norwegian Research Council and the Norwegian Industrial and Regional Development Fund for use on R & D projects into telemedicine.

7 Summary and conclusion

The point of departure of the recommendation of the working party is that telemedicine should be developed within the framework of what is technologically possible, desirable from a medical perspective, organisationally 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.

7.1 Overall recommendation

Certain areas within telemedicine appear to be sufficiently well developed to be put into regular operations. The working party recommends that teleradiology, telecardiology, telepsychiatry and teledermatology be put into regular operations. The same applies to ENT

between research and educational communities and business and industry. The development of regional competence centres for IT such as a telemedical centre in Trondheim could have a major impact on the establishment of regional business communities. Accordingly, it will also have a positive effect viewed from the perspective of regional policy.

As a follow-up to Report No. 38 to the Storting and the Information Technology Plan for Industry from 1998 to 2001 the 1999 budget contained appropriations in the region of NOK 170 million aimed at strengthening IT. Areas of particular interest as regards telemedicine included:

- The establishment of a scheme of product development grants totalling NOK 100 million spread out over four years to be administered by the Industrial and Regional Development Fund's district office in Trondheim. The goal is to make it easier for scientists and inventors to commercialise research results and good product ideas.

- The establishment of an economic scheme for public and quasi-public enterprises. This is designed to stimulate a more user-friendly and efficient public administration through the use of services operating in a large-scale network. The objective is to secure both economic and administrative development and the framework for the scheme for 1999 totals NOK 18 million. The scheme can be used to strengthen and develop the public sector services offered within for example telemedicine.

- The establishment of a national telemedicine programme totalling NOK 25 million. The funds are largely intended to contribute to the strengthening of scientific communities in Trondheim and Oslo, and to promote industrial development in the field.

- An increase in the grant to the National Information Network (NIN) of NOK 10 million to NOK 40 million. This is to facilitate the development of regional information networks and pilot projects in telemedicine, distance education and telemedicine.

- The strengthening of telecommunication research by NOK 5 million in 1997 to NOK 20 million.

Other public sources of funding include the Information Technology in Medicine and Health programme organised by the Norwegian Research Council and public research and development centres (ORU centres) organised by the Norwegian Industrial and Regional Development Fund. The ORU Scheme has earmarked NOK 13 million for health projects in 1998. There are also a number of other funding schemes organised by both the Norwegian Research Council and the Norwegian Industrial and Regional Development Fund for use on R & D projects into telemedicine.

7 Summary and conclusion

The point of departure of the recommendations of the working party is that telemedicine should be developed within the framework of what is technologically possible, driven from a medical perspective, organisationally, socially and economically possible. In order to meet the development of telemedicine and its consequences in the distant direction, public policy must be defined within these limits. For the role 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 research.

7.1 Overall recommendations

Certain areas within telemedicine appear to be especially well developed to be put into regular operation. The working party recommends that telemedicine, telephysiology, telepsychiatry and telemedicine be put into regular operation. The same applies to ENT

and pathology, subject however to a satisfactory patient base and a favourable cost-benefit analysis. Distance education should also be used systematically and in day-to-day operations. If this is to succeed coordination of the various services will be important. The move from good individual projects to routine operations is critical and requires active participation on the part of the public sector during the transitional phase. This applies in particular to the development of methods to stimulate the introduction of new methods.

The working party recommends that the health care regions should define telemedicine as an explicit part of the regional health plans. This will serve to emphasise the central position that telemedicine will hold in the health sector of the future.

Most of the information exchanged within the health service passes between the primary health and specialist health services. The working party recommends that an investigation be conducted into whether funding schemes for equipment specifications, stimulatory funds, operating grants and training can be used to encourage the use of IT between the primary and specialist health sectors. This will represent an important means of introducing IT as a medium of communication between the various areas of the health service. The specific benefits of this approach are that disadvantages relating to distance will be reduced, paper quantities will be lessened and the costs in connection with the transmission of paper-based documents will be cut significantly.

Measures linked to the standardisation of telecommunications for both telemedicine and for a Norwegian health network will be important with a view to securing the efficient exploitation of resources in the health sector. The interest of business and industry in the health market will inter alia be determined by the ability and willingness of the health sector to coordinate its purchases of IT solutions. In this regard standardisation is essential. This work is being performed under the auspices of SHD's standardisation programme in which KITH, KoKom and TMA play important roles. The working party recommends that high priority be given to this work. Players in the health service must follow the standards developed or approved by the bodies responsible for developing and approving standards.

The Telemedical Department at the Regional Hospital in Tromsø must continue to seek to stay ahead of developments and conduct research into the solutions of tomorrow and their consequences. The Department must have special responsibility for initiating and promoting pilot projects and development projects. The Department must function as a competence centre, in both national and international terms, and be the obvious organisation to approach for advice and guidance on matters relating to telemedicine. This is essential in order to ensure that the sector avoids unnecessary additional work relating to the use of telemedical methods. The Telemedical Department must define the terms governing the development of new telemedical services so that in this area too attention is focused on the patient. The working party recommends that the Telemedical Department's efforts should be directed towards development, research, improvement and implementation rather than the operation of telemedical solutions.

The Telemedical Department must coordinate its activities with those of other Norwegian communities. In this regard the working party has visualised the setting up of some form of regional telemedical council that could help to secure the coordinated introduction of telemedicine in Norway.

Internationally large sums are invested in developing telemedical concepts in competition with the Norwegian solutions. We could lose our present competitive advantage if future Norwegian investment progresses too slowly. The Telemedical Department has an excellent reputation internationally and WHO is giving consideration to defining the Department as a WHO centre for telemedicine. The working party therefore recommends that the international reputation of the Department should continue to be maintained and nurtured. For TMA to

and pathology, subject however to a satisfactory patient care and a favourable cost-benefit analysis. Disease education should also be used systematically and in day-to-day work. It is to be noted that the various services will be integrated. The major focus is to ensure coordination of the various services and to ensure active participation of good individual patients to various operations. It is critical and requires active participation on the part of the public sector during the transition phase. This applies in particular to the development of methods to stimulate the introduction of new methods.

The working party recommends that the health care regions should define telemedicine as an explicit part of the regional health plan. This will serve to emphasize the central position the telemedicine will hold in the health sector of the future.

Most of the information exchanged within the health service passes between the primary health and specialist health services. The working party recommends that an investigation be conducted into whether funding schemes for equipment specifications, training funds, operating grants and training can be used to encourage the use of IT between the primary and specialist health sectors. This will represent an important means of introducing IT as a medium of communication between the various areas of the health service. The specific benefits of this approach are the disadvantages relating to distance will be reduced, paper quantities will be lowered and the work in connection with the transmission of patient-based documents will be cut significantly.

Reference is made to the standardization of telecommunication for both telemedicine and for Norwegian health networks will be important with a view to securing the efficient operation of resources in the health sector. The impact of business and industry in the health sector will also be determined by the ability and willingness of the health sector to contribute its resources to IT solutions. In this regard standardization is essential. This work is being performed under the auspices of STI's standardization programme in which EITM, EITM and IMA play important roles. The working party recommends that high priority be given to this work. Factors in the health service must follow the standards developed or approved by the bodies responsible for developing and approving standards.

The Telemedicine Department at the Regional Hospital in Trondheim must continue to act as a catalyst of development and conduct research into the solutions of tomorrow and their consequences. The Department must have special responsibility for training and educating pilot projects and development projects. The Department must function as a competence centre in both national and international terms and be the obvious organization to approach for advice and guidance on matters relating to telemedicine. This is essential in order to ensure that the sector avoids unnecessary additional work relating to the use of telemedicine. The Telemedicine Department must define the terms governing the development of new telemedicine services so that in this area too attention is focused on the patient. The working party recommends that the Telemedicine Department's efforts should be directed towards development, research, improvement and implementation rather than the operation of telemedicine services.

The Telemedicine Department must coordinate its activities with those of other Norwegian committees. In this regard the working party has visualized the setting up of some form of regional telemedicine centre that could help to secure the coordinated introduction of telemedicine in Norway.

Telemedicine is Norway's largest source of investment in developing telemedicine concepts in competition with the Norwegian solution. We could lose our present competitive advantage if Norway's investment progresses too slowly. The Telemedicine Department has an excellent reputation internally and WHO is giving consideration to defining the Department as a WHO centre for telemedicine. The working party therefore recommends that the international reputation of the Department should continue to be maintained and nurtured. For IMA to

maintain its competitive edge, it needs competition from other Norwegian intellectual communities. There should be telemedical activity in all health care regions.

Research and development should in the view of the working party be based on the expertise of the Telemedical Department at Tromsø. Nevertheless, development and pilot projects could take place at other locations in Norway. Our recommendation is that they be proceed in line with the recommendations and advice given by the Telemedical Department at Tromsø. This will reflect the function of the Department as a national competence centre. The role of the Telemedical Department should be to contribute to the quality assurance of projects. The Department will perform an advisory and recommendatory function. The Ministry will also use the Department's expertise when it comes to evaluating financial support for research and development projects. This could be organised through the telemedical programme councils that could be organised in connection with the secretariats of the regional health committees. As such they would function as feeds to the regional health committees. These councils could be organised into a network in which the Telemedical Department might form the hub, i.e. function as the network centre.

A national centre for telemedicine with a consultative and advisory function in relation to telemedical methods could be a means of coordinating a fragmented sector. Furthermore, a national telemedical centre could create the basis for commercial development. It is not unrealistic to visualise that the competence generated in the development of telemedicine might also be applied in other industries and sectors.

The working party views evaluation as a key tool for ensuring that the development of telemedicine progresses in the desired direction. In the view of the working party evaluation must form a standard part of any telemedical project. Services operated on a routine basis must also be subject to evaluation.

7.2 Responsibility relating to the development and operation of telemedical solutions

An overriding responsibility of central government must be to ensure that Norway continues to remain in the forefront of telemedicine. This means that central government must ensure that research is conducted within this area. The Ministry's view is that the Telemedical Department at Tromsø is the leading centre of telemedicine in the country. The central authorities will seek advice and recommendations from the Telemedical Department as an aid in assessing development projects. It will be up to the county municipalities as hospital owners and the regional health and social welfare committees to ensure that telemedical solutions form part of regular health service operations in all areas of the country. The Ministry is able to give signals that the spread of telemedicine is an area of national priority. As such, it must be reflected in the regional health plans.

In those cases in which telemedical methods are sufficiently well developed to form part of regular operations, activities must be funded in the usual way through refund schemes, framework grants and county municipal funds. Telemedical activity should be anchored in organisational in the individual specialist department at the individual hospital. This will represent a more streamlined and efficient solution than dedicated IT or telemedicine departments. This latter approach would require support in the form of a user support department.

Telemedicine must function as a means of achieving central government health policy targets and the Telemedical Department will act as an advisory body to the Ministry of Health and Social Affairs. Internal organisation must take place at central level and between SHD, NHD,

maintain its competitive edge. It needs competition from other Norwegian universities.
Universities. There should be telemedical activities in all health care regions.
Research and development should in the view of the working party be based on the activities
of the Telemedical Department in Troms. Investigations, development and pilot projects
could take place at other locations in Norway. Our recommendations in this area are presented
line with the recommendations and advice given by the Telemedical Department in Troms.
This will reflect the function of the Department as a national telemedicine centre. The role of
the Telemedical Department should be to contribute to the quality assurance of projects. The
Department will perform an advisory and consultancy function. The strategy will also
use the Department's expertise when it comes to evaluating financial support for research and
development projects. This could be organised through the telemedical programme committee
that could be organised in cooperation with the secretaries of the regional health committees.
As such they would function as leads to the regional health committees. These committees could
be organised into a network in which the Telemedical Department might form the hub, as
function as the network centre.
A national course for telemedicine with a consultative and advisory function is related to
telemedical methods could be a means of coordinating a fragmented sector. Telemedicine
national telemedical centre could create the basis for commercial development. It is not
unrealistic to envisage that the competence generated in the development of telemedicine
might also be applied in other industries and sectors.
The working party envisages as a key tool for ensuring that the development of
telemedicine progresses in the desired direction. In the view of the working party evaluation
must form a standard part of any telemedical project. Services operated on a local basis
must also be subject to evaluation.

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An overriding responsibility of central government must be to ensure that Norway continues
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in assessing development projects. It will be up to the county municipalities or hospital
owners and the regional health and social welfare committees to ensure that telemedical
solutions form part of regular health service operations in all areas of the country. The
Ministry is able to give advice that the spread of telemedicine is an area of national priority.
As such, it must be reflected in the regional health plans.
In those cases in which telemedical methods are sufficiently well developed to form part of
regular operations, activities must be funded in the usual way through regional health
framework grants and county municipal funds. Telemedical activity should also be
organised in the individual specialist department at the individual hospital. This will
require a more streamlined and efficient solution than dedicated IT in telemedicine
department. This latter approach would require support in the form of a national
department.
Telemedicine must function as a means of achieving central government health policy objectives
and the Telemedical Department will act as an advisory body to the Ministry of Health and
Social Affairs. Internal organisation must take place at central level and between 2010

KRD and SND's facilities in the field. Relationships with institutions such as KITH and KoKom must be characterised by dialogue and openness.

Northern Norway Health Care Region should function as a shop window for telemedical solutions and be open towards and provide information to other players, both national and international. The development of telemedical services on a grand scale will demonstrate to other players how the method should be used and function as a laboratory for testing new solutions. Such a model would also offer Norwegian technical communities scope for developing themselves in the interfaces between technology, organisations and users. Holistic concepts of this nature involving tight integration between technology, interfaces, organisations and users will be dependent upon an active and well developed user community within the region. A one-sidedly technological orientation would be more exposed to international competition than a holistic approach.

The Telemedical Department will not be responsible for commercialisation and industrialisation. This will be the responsibility of other players. The practical implementation of and questions relating to the financing and operation of a telemedical centre do not form part of the working party's remit.

To sum up, the working party has concluded as follows:

- There is a need for a competence centre for telemedicine.
- Telemedicine represents a means of organising and developing the health sector. The Ministry will seek advice from TMA on technical questions relating to telemedicine.
- TMA is an appropriate independent advisory body with regard to the implementation of major development projects.
- TMA will be oriented towards development and have an academic base.
- Region 5 must create conditions that permit extensive use of telemedicine and function as a shop window for telemedical services.
- The relationship to the Ministry's standardisation programme and KITH must be expressly stated and binding.

7.3 The need for further information and further reporting requirements. What is the next phase?

The funding of schemes and organisation in connection with telemedicine will require further reporting. The active and many-sided use of telemedical solutions will require refund schemes to be developed with this in mind.

Telemedicine has considerable potential in the emergency aid context. Telemedical methods may in a number of cases be the decisive distance compensating tool allowing advice to be given to local units.

The main challenge in introducing new technology lies at the organisational level. This challenge will always exist and continuous work will therefore be required on the administrative, legal, ethical, district/political and organisational aspects of using telemedical methods. The investigations conducted so far have been based on existing technology. New investigations should therefore be implemented as technology is developed and its use becomes more widespread.

The working party is of the view that it has demonstrated that within a number of disciplines telemedical methods are comparable to traditional methods and that in some contexts it has an advantageous economic profile. The working party views the use of telemedicine as justifiable from a medical perspective. In accordance with its remit the working party has not conducted a complete assessment of commercial and financial questions relating to the establishment of a telemedical centre.

ERD and SMD's facilities in the field. Relationships with institutions such as KTH and KTH must be characterized by dialogue and openness.

Norwegian Health Care Region should function as a pilot region for telemedicine solutions and be open towards and provide information to other players. Joint national and international. The development of telemedical services on a grand scale will depend on other players how the method should be used and financed as a laboratory for testing new solutions. Such a model would also offer Norwegian technical communities a role in developing themselves in the interface between technology, organization and users. Health concepts of this nature involving tight integration between technology, organization and users will be dependent upon an active and well developed user community within the region. A one-sidedly technological orientation would be more exposed to international competition than a holistic approach.

The Telemedical Department will not be responsible for commercialisation and industrialisation. This will be the responsibility of other players. The practical implementation of and questions relating to the financing and operation of a telemedical centre do not form part of the working party's task.

To sum up, the working party has concluded as follows:

- There is a need for a competence centre for telemedicine.
- Telemedicine requires a network of organizing and developing the health sector. The Ministry will seek advice from TMA on technical questions relating to telemedicine.
- TMA is an appropriate independent advisory body with regard to the implementation of major development projects.
- TMA will be oriented towards development and have an academic base.
- Region 2 must create conditions that permit extensive use of telemedicine and function as a step towards telemedical services.
- The relationship to the Ministry's telemedicine programme and KTH must be explicitly stated and clarified.

2.3 The need for further information and further reporting requirements. What is the next phase?

The finding of evidence and organization in connection with telemedicine will require further reporting. The active and many-sided use of telemedical solutions will require further schemes to be developed with this in mind.

Telemedicine has considerable potential in the emergency aid context. Telemedical methods may in a number of cases be the decisive distance compensating tool always where there is given medical care.

The main challenge in introducing new technology lies at the management level. The challenge will always exist and continuous work will therefore be required on the administrative, legal, ethical, organizational and organizational aspects of any telemedical methods. The investigations conducted so far have been based on existing technology. New investigations should therefore be implemented as technology is developed and its use becomes more widespread.

The working party is of the view that it has demonstrated that within a number of disciplines telemedical methods are compatible to traditional methods and that in some contexts it has an advantage as economic profiles. The working party views the use of telemedicine as justifiable from a medical perspective. In accordance with its task the working party has not conducted a complete assessment of commercial and financial questions relating to the establishment of a telemedical centre.

High priority must be given to this in the next phase of the work. The working party is therefore of the view that the Ministry of Health and Social Affairs should recommend further investigations into a telemedical centre in Tromsø.

The working party also recommends the establishment of telemedical programme councils in each individual region and that the work started by the working party be continued in the form of project work with specific measures.

Appendix 1 - Abbreviations and concepts

ATM: Asynchronous Transfer Mode. High speed network technology. ATM has very high bandwidth and is therefore suited to, for example, real time transfers of video, speech and data. ATM is defined as broadband ISDN.

ISDN: Integrated Services Digital Network. An international telecommunications standard for the transmission of sound, pictures and data over digital lines.

EDI: Electronic Document Interchange.

ECG: Electrocardiography

PACS: Picture Archiving and Communication System

RIS: Radiological Information System

The budget recommendation of the Social Affairs Committee of the Storting contains a majority proposal that the Government should conduct an investigation into the establishment of a national centre for telemedicine in Tromsø. This proposal was put forward after the appointment of the working party. The proposal serves to emphasize that this will be an area of interest in the future.

KITH is functioning as the secretariat for the IT action plan. Telemedicine forms part of this plan.

This does not mean that telemedicine will give all patients access to specialists. The general practitioner will continue to refer patients to specialists. However, a referral to a telemedical consultation may entail that the patient gains access to both a specialist and general practitioner.

Forum for Organizational Development is a joint project established in 1987 for the Ministry of Health and Social Affairs and The Norwegian Association of Local Authorities. The forum represents a follow-up to the Stein Committee's report on internal organization and management in hospitals (NOU 1992:2 "The Patient First!")

Managers should be understood as, for example, County Directors of Health*, Hospital Managers and Senior Departmental Physicians.*

Video conferencing equipment is one type of equipment that can be used by a great many different user groups. This makes it easier to justify investment and operating cost.

By treating approximately 700 dermatology patients at Kirkenes and Hammerfest instead of sending them for consultations at RiTø, the National Insurance Administration saves approximately NOK 2 million in travel expenses per year. At the same time the primary health service has invested in equipment and the specialist health service has increased its level of activity. This investment and increase in activity are not reflected in budgets.

Fewer patients are referred when telemedical consultations are used. This could release some time and resources in the hospitals.

One example of this might be cases in which both the primary doctor and the specialist acted properly but where an error nevertheless occurred. In such situations it could be argued that the patient him/herself is responsible for the incorrect treatment. This is not a reasonable arrangement.

High priority must be given to this in the next phase of the work. The working party is
structure of the view that the Ministry of Health and Social Affairs should recommend
further investigations into a telemedical centre in Tromsø.
The working party also recommends the establishment of telemedical programs consisting
each individual system and that the work started by the working party be continued in the
form of project work with specific measures.

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bandwidth and is therefore suited to, for example, real time transfer of video, speech and
data. ATM is defined as proposed ISDN.
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majority proposal that the Government should conduct an investigation into the possibilities
of a national centre for telemedicine in Tromsø. This proposal was put forward after the
appointment of the working party. The proposal serves to emphasize that this will be an area
of interest in the future.
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plan.

This does not mean that telemedicine will give all patients access to specialists. The general
practitioner will continue to refer patients to specialists. However, a referral to a telemedical
consultation may mean that the patient gains access to both a specialist and general
practitioner.
Forum for Organizational Development is a joint project established in 1989 by the Ministry
of Health and Social Affairs and The Norwegian Association of Local Authorities. The forum
represents a follow-up to the State Committee's report on internal organization and
management in hospitals (NOU 1985:2 "The Patient First").

Managers should be understood as, for example, County Director of Health, Hospital
Managers and Senior Departmental Physicians.
Video conferencing equipment is one type of equipment that can be used by a great many
different user groups. The major factor to justify investment and operating cost
by testing approximately 700 dermatology patients at KITH and then to transfer the
sending them for consultation at KITH, the National Insurance Administration saves
approximately NOK 3 million in travel expenses per year. At the same time the primary
health service has benefited in equipment and the specialist health service has increased its
level of activity. This investment and increase in activity are not reflected in hospital
fewer patients are referred when telemedical consultations are used. This could release some
time and resources in the hospitals.

One example of this might be cases in which both the primary doctor and the specialist attend
properly but where an error nevertheless occurred. In such situations it could be argued that
the patient himself is responsible for the incorrect treatment. This is not a telemedical
arrangement.

The estimated figure for the transfers of knowledge is uncertain. However it is a fact that the primary doctor gains access to the expertise of the specialist. It is therefore reasonable to include the estimated transfer of expertise.

PACS solutions are essential to the development of a national teleradiological network. For this to be realized it is essential with regional and national measures in relation to standardisation, the development of interfaces and purchasing.

Trine Bergmo in *The Journal of Telemedicine and Telecare*, Vol.3 No. 1 1997, and Vol. 2 1996.

