



Benefits from telemedicine in Norway

An examination of available documentation

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Foreword

What are the benefits of telemedicine for Norwegian health services? What kind of results can be shown? The background for this report is a project that aims to shed light on these questions, both in regard to economic and qualitative aspects. The presentation is built upon available documentation from services and projects.

The National Centre for Telemedicine (NST) has completed the project, with NORUT Social Science Research as co-operating partner. The project is financed by funds from Høykom and a contribution from NST.

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The report is to a great extent prepared by the project group in co-operation. Elin Breivik has prepared the economic section of the document study and Robert Myrvang has had the main responsibility for the review of the qualitative results. Project leader has been Elin Johnsen, NST.

Hammerfest, May 2006.

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Chairman, Høykom and

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1 Summary

Qualitative benefits

In all, 29 studies show benefits and potential for qualitative benefits. The results are presented in three main categories: Electronic patient records (EPR) and electronic messages, discipline-specific solutions and patient-oriented solutions.

A certain degree of integration has been developed between EPRs and electronic information that is exchanged between primary and specialist health services. Documented benefits are that the institutions avoid duplicating tasks and there are fewer errors made in recording patient information. In general practitioners offices (GP-offices), EPRs have contributed to the re-deployment of resources – among other things, medical secretaries have been delegated more interesting duties. In the nursing and care services, mobile EPRs for nursing and care documentation have contributed to simpler routines and fully updated records and to faster communication with the outside world.

In the case of discipline-specific services, documented qualitative benefits can be found in enhanced expertise for health personnel, as well as increased levels of quality experienced by patients. The exchange of monitoring information from teledialysis of patients with kidney failure has contributed to a higher level of care quality. Teleradiology and fundus photography of patients with diabetes contributes to less travelling for patients. For teledermatologi an enhanced level of expertise and a better selection procedure for patients requiring hospital treatment has been documented. In emergency medicine, the solution for acute heart problems saves time and the benefits increase in step with the travelling time to hospital.

In the case of telemedicine solutions that contribute to empowerment for patients, the documentation shows positive results in accordance with the available literature on “Internet-based self-help”.

The benefits show as greater openness regarding illness and in some cases it is easier to discuss sensitive issues “online” than face-to-face. E-mail between patients and GPs seem to lead to a relationship of trust between the patient and health service personnel, as well as replacing a number of consultations and telephone enquiries.

Economic benefits

Nine of the studies of the economic consequences of telemedicine show benefits or potential for benefits. Analysis shows that the cost-effectiveness of telemedical services and electronic messages exchanged is often dependent on investment costs, the number of consultations or electronic messages exchanged per year that are made with the help of telemedicine, as well as the costs of travelling to a specialist hospital. The results are often presented as break-even point which expresses the number of consultations that must be made annually with the help of telemedicine in order that telemedicine shall be more cost-effective than the traditional method of holding consultations, which often means that the patient must travel to a specialist hospital. In two of the studies, the conclusion is that the evaluated service is cost-effective; seven of the studies show that there is some potential for cost-effectiveness; however the services were not used enough at the time of evaluation to show benefits.

Conclusions and recommendations

Two conclusions can be drawn from the review of the projects:

- I. The economic benefits depend mainly on the volume of use of the services. Often, the use of telemedical services is not great enough to achieve benefits, however when their use reaches a certain scale, the service will be cost-effective.
- II. A number of studies show areas of qualitative benefits. It is more difficult to meas-

ure quality than money in a meaningful way. Partly, the analyses presented do not include clarification or discussion of their basic premises.

There is a demand for information about the benefits of telemedicine, but in relation to the demands the documentation can be said to be somewhat limited. This may be due to the fact that telemedicine is a relatively new research field, and that both the use of technology and research are under development. Furthermore, the current appraisal of benefits is influenced by the fact that it is mainly pilot programmes and small-scale services that have been evaluated.

The expectations and aims of the new technology have increased. This makes it more complicated and costly to both realise and analyse the benefits. At the same time this may lead to several more institutions experience benefits of using the services and that potential benefits are thus realised.

Currently, the focus is not only on the technology in regard to development of telemedical services, but also on the social challenges. This focus requires further development if social benefits are to be better illustrated. Relevant issues may be: which problems do current and future health sectors need to solve, and can telemedicine contribute to solving these challenges?

On the basis of the conclusion that the volume of use of telemedical services must be increased in order to realise the potential benefits of telemedicine, the following is recommended:

- I. Analysis of the measures that can lead to increased use of telemedical services, including analysis of the adequacy of the different measures for different potential users
- II. Analysis of the adequacy of management and implementation measures for realisation and increased use of telemedical services, and to provide arrangements so that those who may use telemedical services, actually do so

The report shows areas of benefits that are documented. It is important that there may be more areas of benefits, and that they will develop further in relation to both technology and social processes.

We recommend prioritising studies that place emphasis on developing the methodological approach in order to evaluate qualitative benefits. In order to achieve a better basis for making decisions, studies may be commissioned that integrate analysis of qualitative and economic benefits. We also recommend stimulation of development of new, relevant issues in this field.

In future work, a relevant perspective on telemedicine and the design of telemedical services is needed, so that they may function as aids to work within the field of professional medicine and as management tools for the authorities. The former may include administrative organisation. The latter may include, for example, localisation of services, division of organisational functions and prioritising of patient groups.

2 Introduction

Norwegian health authorities took the first initiative in developing the health sector by employing information and communication technology (ICT) in the 1980s. There is a growing demand for information on the benefits of this technology. This report focuses on documented benefits of telemedicine in Norway.

2.1 Increasing expectations and challenges

Strategy documents communicate the expectations of positive effects of the technology, both in regard to efficiency and quality [1–7]. These documents also show how the aims for the use of the technology have expanded along the way.

The strategies in relation to the politics of health care reflect the complexity of this sector. The volume of information and communications in the health service is large, and the public health sector has a wide range of services, with many contributors – with correspondingly large and complex management and financing systems. The use of ICT offers, therefore, a considerable benefit potential in the handling of the sector's and services' complexity. It can contribute to information and communication systems that are more effective and offer greater quality of information in the sector, and to provide a new basis of information for management and other forms of decision making.

The complexity of this sector creates correspondingly large challenges. A great deal of different considerations and interests must be taken into account when making decisions on the politics of health care. The health authorities, however, have not been satisfied with the development status and use of ICT in the sector; the sector

does not create total, unified and compatible technological solutions, and the authorities have therefore themselves become engaged in development work [8]. Whilst separate systems and subsystems in the sector have been run according to peculiar and partial considerations and interests, the state, via the health authorities, has attempted to manage and realise the common, or society's interests [9]. This has been achieved mainly through infrastructures, financial support systems and management adjustment.

The establishment of the Norwegian Health Network¹ is one of the most central IT-strategical initiatives in this sector. The Norwegian Health Network is established as a closed network for electronic communication and interaction in the health and social sector in Norway. The Norwegian Health Network AS was formed in 2004 and is owned by the five regional health enterprises. The background for the formation of the Norwegian Health Network was to offer a sound basis for interaction between health care personnel and between health care personnel and patients. The Health Network shall safeguard data quality, information security and personal information protection in the exchange of sensitive information [10].

2.2 Benefits of telemedicine in Norway

The time is now right to reveal the results of the use of technology in the health services. This report focuses on this issue. The report describes and systemises documented benefits for Norwegian health services of telemedical services and projects. Relevant projects and services have been identified and available documentation of both economic and qualitative benefits has

¹ <http://www.nhn.no/tiki-index.php?page=InfoNorskHelsenett>

been reviewed. On this basis a presentation of the results has been prepared. The report deals with realised benefits of telemedicine. Services that show potential for benefits have also been included.

2.2.1 Definitions and limitations of the report

Definition of telemedicine

The term telemedicine means work within professional medicine – diagnostics, treatment, supervision and monitoring – in which ICT is used to communicate relevant treatment information on certain patients. Furthermore, it also encompasses communication related to treatment between carer and patient, and self-help groups for patients. Many use the term “e-health” as a collective description.

The concepts of benefits and potential benefits

The concept benefit is used to mean a positive result. In a sector that is financed by public funds and is not run for profit, appropriate use of public resources is important, in regard to both finances and the quality of the services offered. The aim is to gain knowledge as to whether telemedicine has economic or other advantages over alternative solutions, without allowing costs or disadvantages to exceed the advantages.

Benefit means a realised result. The report also mentions potential benefit. Potential benefit means a possible result that has not been realised, but remains latent in a certain telemedical solution. A benefit analysis is based on one or another form of effect analysis; an analysis is made of the positive results of use of telemedicine – under certain premises. Effect analysis is a useful and adequate method of highlighting many issues. An analysis of the potential can reflect over what is not reality at the moment, but is possible and can be realised in the future. These analyses can be made more or less speculatively, just as they can be well-founded.

Economic and qualitative aspects

The presentation makes a division between

economic and qualitative results and potential benefits. The economic results are found in studies that use monetary values. The qualitative category uses studies that deal with issues of a qualitative type; however these may also include quantitative measures and indicators.

Compilation of information

The report presents available documentation on the benefits of Norwegian telemedicine, obtained through Internet searches. In addition, some verbal enquiries were made to include recently completed and ongoing projects that show or will show benefits and/or benefit potential. The material was compiled during the latter part of 2005 and early in 2006.

Method of Internet search

Search word:

Egenmestring/selv-mestring/empowerment (self-help/self-command/empowerment) + Internett (Internet), e-helse (e-health), helse (health) + it (it), teledermatologi (teledermatology), teledialyse (teledialysis), telemedisin (telemedicine), telepatologi (telepathology), telepsykiatri (telepsychiatry), teleradiologi (teleradiology), teleultral lyd (teleultrasound)

Search services:

Bibsys; Google – here, also English terms were used, with the search words Norway and Norwegian; PubMed – corresponds to Google and the websides to HØYKOM, about health (Projects: health/social); KITH; NFR; NORUT Social Research; NST; RHF; Shdir; SINTEF; Telenor

Date filtering:

Published from and after 2000. The date filter was chosen because the technology and knowledge basis is changing quickly. We do not believe that any relevant information was excluded.

Not included:

Preliminary projects in which the main project is completed, and projects that test technology

3 Review of the documentation

The following presentation shows the results from the review of the material. The presentation differentiates between economic and other benefits. The latter has largely qualitative measures. In total, 84 surveys were compiled through the Internet-based survey. Of these, 24 deal with economic results and 60 with qualitative results. The material presents both positive results and benefit potential.

3.1 Qualitative benefits

In total, 60 studies were found and evaluated in regard to qualitative benefits. After systematic review, 29 studies were included. In order to be included, the study had to include a problem to be addressed and describe the telemedical solution as an alternative to other solutions. Furthermore, the studies had to confirm their answers to the problem with empirical evidence and account for the methodology. In the following, results from the evaluation are grouped into three main categories:

- EPRs and electronic messages
- Discipline-specific solutions
- Patient-oriented solutions

3.1.1 EPRs and electronic messages

At GP-offices the use of EPRs has led to a situation in which gradually more of the traditional medical secretarial duties, primarily writing doctors' notes or dictation, have been eliminated. This has released resources for other tasks, and medical secretaries have been delegated other, more interesting duties [11, 12]. There is an attempt to find solutions that satisfy the hospitals' requirements for information that also can free up resources [13, 14].

An examination involves the use of mobile EPR solutions for documentation of medical treatment in home nursing services, where the nurse is granted mobile records access for making reports.

This solution contributes to keeping the patient's journal updated [15]. Another study documents benefits when upgrading EPRs at the GP-offices. The original version was replaced with broadband-based access to the Internet and e-mail from the same PC that contains the records system. This service led to simpler routines both for preparatory and post-examination work, as well as faster communication with the outside world [16].

There is currently a certain amount of integration between EPRs and other documents that is exchanged between primary and specialist health services. The two most important documents in regard to volume are referrals and discharge letters. The potential for benefits lies mainly in that institutions avoid duplicating tasks and reduce the probability of errors, as patient information is not entered manually several times. Studies that have examined practices concerning referrals and discharge letters show that there are challenges presented in current work practices, mostly related to organisational issues and internal company culture [13, 17-19]. These would appear to be important for the potential to realise benefits, both in relation to quality of treatment and professional benefits [17].

Large information volume categories – an illustration [20]

- Approximately 20 million patient contacts with GPs per annum, the cost of which is borne by the National Insurance Service
- 3.5 million certificates of absence due to sickness/sickness benefit certificates to the National Insurance Administration
- 1.9 million referrals to hospitals
- 3.9 million discharge letters from hospitals
- 7 million requisitions for tests to laboratories (+ corresponding number of results)
- 1.3 million requisitions for images to hospitals
- 1 million requisitions for physiotherapy
- 17 million prescriptions to pharmacies

The table above illustrates the large volume of information involved in the communication processes within the health sector. In addition, there is a considerable amount of information passed inside and also between hospitals and in communications with the municipal care and nursing services. A great potential for benefits in regard to the reduction of duplicated tasks and potential for errors is a logical conclusion, if many more were to exchange of information electronically. This exchange is technically possible, and the Norwegian Health Network offers secure transfer of electronic information. However, what is technically possible is not necessarily socially possible, to the same degree – greater changes in user behaviour are needed in order to realise the full benefit potential ²

A survey of electronic messages and conditions for co-operation in the nursing and care services show that time-saving benefits in this case must be seen in connection with the amount of time spent on the telephone, time used for registration and documentation, and also time spent transporting patients that have been to doctors' appointments or have been discharged from hospital. The introduction of electronic solutions contributes to the exchange of more information and makes better routines possible. A daily challenge in traditional practice for nursing staff is the accumulation of incomplete telephone enquiries to other co-operating institutions. In this case, benefits are gained in the form of faster and completed exchange of information, which in turn leads to faster and better co-ordinated follow-up of patients in the nursing and care services.[21]

3.1.2 Discipline-specific solutions

Radiology, which is the oldest telemedicine service, is the single service in which the qualitative benefits of digitalisation are beyond any doubt. Most hospitals in Norway have digitised x-ray services, and it is fully possible to send images to radiologists for review, so that the patient does

not have to travel. A study from 2004 shows that teleradiological transfer of images in neurosurgical cases between local hospitals and neurosurgical specialist units reduced the number of journeys and has led to better professional treatment of patients [22]. For teleradiology, a major benefit will be the reduced need for meetings and reduced response time from x-ray departments and more readily available information [20].

Radiology (neurosurgery) In 34% of the cases, unnecessary travels were avoided (N=92). [22]

Teledermatology is used, for example, with the help of video conferencing. This is a solution where the patient and their GP, consult a specialist and the consultation provides an immediate result, and the treatment can begin at once. In the case of still image solutions, the GP sends images and a written referral, and the images and text can be evaluated at different times. GPs experience that this solution contributes to a better method of selecting patients that need to go to hospital and that GPs enhance their expertise in dermatology and it is felt that it inspires confidence, to be able to get a second opinion in skin treatment cases. [23-25]. Teledermatology is anticipated to have considerable potential for treatment benefits for patient groups with chronic skin diseases, for example placement of equipment in nursing homes and home care for sore treatment cases [23, 25].

Teledermatology – better selection Using a video conference solution between Kirkenes and Tromsø, 79% of patients did not have to travel (N=375). [26]

In emergency medical care, diagnosis using telemedicine via pre-hospital ECG has reduced the time expired before percutaneous coronary intervention. Especially for patients that are in hospitals that do not have the possibility to perform

¹ Figures for information exchanges in the Norwegian Health Network can be found at: <http://www.shdir.no/samspill/indikatorer/>

the treatment, it is a benefit that the patient can be sent directly to a hospital that has the capacity to perform percutaneous coronary intervention. Normally, two of three patients that are in hospitals without this form of treatment must go there first [27]. Pre-hospital thrombolytic treatment has been carried out in a project in Troms and a study from 2005 shows that the benefit of early thrombolytic treatment is greater, the further the patient has to travel to hospital [28].

Fundus photography of patients with diabetes via telemedicine is used as a control measure, especially in regard to potential blood clots in the eye. It is estimated that approximately 2.3% of the population suffer from diabetes [29]. If retinopathy is not treated it can lead to blindness. Medically, there is agreement that it would be favourable to undergo annual checks in the form of fundus photography. In a study based on interviews, both patients and health service personnel express greater satisfaction in the use of telemedicine instead of more traditional solutions [30]. The service can be expanded to include field of vision controls, images of the optic nerve and pressure control for other groups of patients. The service also improves the accessibility of eye examinations for diabetics that live some distance from eye specialists. One benefit can be that the capacity of an ambulant specialist is employed more efficiently because the patient is treated via the Internet, whilst newly referred patients are given priority when the specialist is ambulant. [25]

Teleradiology in GP-offices A study shows that 90% of 2280 patients interviewed preferred a local service. The patients were very satisfied with the fact that the service offers radiology locally and that the waiting time is minimal. [31]

Telemedicine used in eye ground screening 76% of 32 patients were satisfied with the local availability of eye ground screening using telemedicine, because they did not have to travel, gained access to specialist services and because the service was offered in familiar surroundings. [30]

Teledialysis is offered to patients with kidney failure. The service is offered outside of the specialist hospital, and is manned by specialist nursing staff, and a video conference image between the units replaces the communication that previously was conducted by letter, telephone or in person. The monitoring information is continually available to the specialist during the treatment. According to health service personnel, it is especially the quality of treatment that is increased with this type of service [25, 32]. The advice that is given from the specialist hospital can be given with greater confidence. The personnel that perform the dialysis have greater confidence because they receive faster and better quality information in return [33].

Pre-hospital ECG The time from the onset of symptoms to intervention was significantly shorter than any recently published data for 100 patients from the same hospital without ECG in the ambulance. One main reason was that two thirds of the patients that belonged to other hospitals could be transferred directly to Ullevål. [27]

Heart murmur Of 151 theoretical cases of secondary murmur, 12.6% were unnecessarily recommended for referral, whilst 87.4% were correctly advised that referral was not necessary.[34]

A service makes the monitoring of suspicious heart murmur in children possible. A study concludes that referrals that utilise telemedicine are medically sound, and can also reduce travelling and use of time [34].

One project has demonstrated how the close relatives of a child with autism and the teachers at the child's school could make contact with professional groups elsewhere in the country via videoconference [35]. This illustrates how current technology has potential benefits in connection with rare medical conditions, since specialist personnel are located in only a few places.

3.1.3 Patient-oriented solutions

Some telemedical solutions contribute to self-help among patients. Currently, this category involves mainly psychiatry and the use of the Internet. Two studies examined whether the Internet is helpful for persons with serious psychological illnesses [36, 37]. These studies point to positive experiences that correspond with available literature on the Internet as “net-based self-help”. The positive effect of the use of the Internet that is especially emphasised is the establishment of contact with other people on their own terms. The focus is also on the question as to whether such services contribute to greater openness concerning psychological problems [37]. In a similar study, the use of net-based discussion groups for people with psychological problems was examined, i.e. who uses this type of service and which health-related implications there are in regard to participation in these groups [38]. The majority of respondents said that it was easier to discuss sensitive problems online than face-to-face. An important element for most was that they were able to use a pseudonym. The discussion groups were perceived as a supplement to traditional therapy. The majority would like to see professionals taking a more active role in these types of fora.

In a study of a service in which 48 patients used e-mail to contact their GP, both the patients and the GPs were on the whole very positive. Also, those patients that did not use the service said that they expected to use the service in the future. Electronic communication seems in this case to replace some consultations and telephone enquiries. The study gives grounds to expect that this type of communication between patient and GP will become increasingly important in the future. The patients found it on the whole to be easier to remember and to communicate their health-related questions and problems by using text-based communication. It was found that the service made the way for a trusting relationship between the patient and doctor, which in turn will also give an increased health benefit through an enhanced feeling of empowerment [39]. The writers of the study warn against increased medicalisation as an undesirable result. This is an aspect

that must be evaluated when this type of service is introduced.

Health-related discussion groups on the Internet A study shows that patients believe it is easier to discuss personal problems on the Internet than face-to-face. The solution is seen as a supplement rather than a replacement for professional services. [40]

One service offers the transfer of blood sugar readings in cases of child diabetes, from the child's mobile telephone to the parent's for monitoring of their state of health. A study of the service illustrates that which many studies of telemedical solutions document; that even though the users (in this case the parents) demand this kind of solution because it gives confidence vis-à-vis the health of the child, it cannot be documented that there are any immediate benefits in the short term – these benefits will only show in the long term through reduced delayed effects for diabetes patients [41].

3.2 Economic benefits

Written documentation which dealt with economic benefits were found for 24 projects and services. Ten of the identified documents were eliminated because they did not satisfy the following criteria: The studies had to address a distinct problem, and to describe a defined alternative to the use of telemedical services. In addition the study had to include estimates of both costs and savings with the use of telemedicine.

The 14 studies that were included in our review were all cost-minimising analyses, in which the cost of implementing telemedical services was compared to alternative methods of performing the health service. This method of evaluation does not allow for valuation of the quality or consequences and similar health outcomes are therefore assumed [42]. The analyses only include costs that vary between the alternatives.

Methods for economic evaluation of health services [42]

Cost-benefit analysis

All costs and benefits of alternative treatments are expressed in monetary values and compared.

Cost-effectiveness analysis

Costs and the effect of two or more treatments are compared and the effect is measured in a certain unit (for example the number of extra years of life or avoided coronaries).

Cost-minimising analysis

Costs of alternative treatments are compared when the health effect is similar.

Cost-utility analysis

Costs of alternative treatments are compared with the benefit of improving a certain state of health. Benefit is measured in quality adjusted life years (QALYs), i.e. the sum of increased quality of life and extra life expectancy.

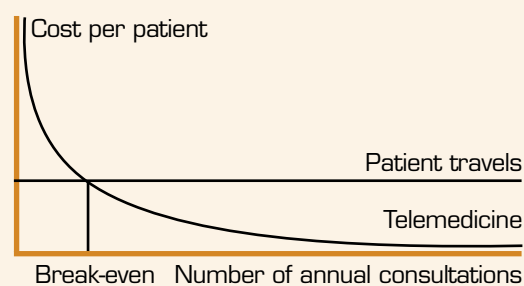
Of the reviewed studies, one is concerned with the electronic exchange of information [43], one studies the introduction of EPRs in municipal nursing and care services [44], while 12 analyse different forms of telemedical patient consultations [31, 32, 45-53].

These economic analyses show that the economic benefits of telemedical services and electronic messages are often dependent on investment costs, the annual number of telemedical consultations or electronic messages and the travel cost to a specialist hospital. In addition, two of the studies estimate savings because hospital admissions are avoided.

Telemedical services often involve high, fixed annual costs, while the variable costs are low. Cost per patient (average cost) is therefore reduced as more patients are treated with the use of telemedical equipment. The average costs of the

alternative, usually the cost of travel to a specialist hospital, will normally remain constant. The result of the economic evaluation of telemedical services is often formulated as a break-even point, which shows the annual number of consultations that must be performed in order for telemedicine to be more cost-effective than the alternative (figure below). The break-even point can be used to estimate the probability that a telemedical service will be cost-effective.

Break-even point for determining the cost-effectiveness of telemedicine



Among the studies that we have reviewed, several report a break-even for the number of consultations or electronic messages that are necessary to achieve cost-effectiveness. Studies of teleradiology and video consultations in dermatology show that the service has sufficient volume to make the telemedical service more cost-effective than the alternative method of providing the service in certain concrete cases [26, 31]. In both services the patient is examined within the primary health service and therefore the cost of travel to a specialist hospital is avoided.

Seven of the studies document cases in which the actual patient base is large enough to make the services potentially cost-effective. At the time the study was made, however, there were not enough consultations held or electronic messages made to make three of these services cost-effective. Electronic referrals will be cost-effective for GP-offices and the hospitals Northern Norway if 51% of all referrals are sent electronically. The benefits are gained mainly through less time spent on each case and lower postage costs [43]. The break-even point for still images

used in dermatology in Northern Norway is different for each individual GP-office. Two of the studies show that the benefits are associated with a reduction in patient journeys and the service will therefore be more cost-effective in municipalities with high travel costs to specialist hospitals [51, 53]. Fundus photography in Alta will be cost-effective if a sufficient number of diabetic patients in the municipality use the service. The benefits for this service can also be associated with a reduction in patient travel [49]. A study of mobile x-ray examinations of hospital patients in the Oslo region shows that cost-effectiveness depends on the distance from the hospitals to nursing homes. The greater the distance to the hospital, the better the cost-effectiveness [45]. Two of the services in which the patient base was large enough to reach the break-even point were not up and running [47, 50]. Five of the studies concludes that the evaluated services are not cost-effective [32, 44, 46, 48, 52].

The co-ordinated use of equipment and other services can improve the cost-effectiveness of telemedical services. Video conferencing equipment that is suitable for telemedicine in pre-natal care in Lofoten can be used in other telemedical services at the hospital [46], while the cost-effectiveness of net-based hearing aid adjustment in Trøndelag will improve if the video conference equipment is shared with other municipal services [48]. Still image referrals in dermatology can be more cost-effective if software, digital camera equipment and the Norwegian Health Network is used for other services in general practice [53].

Any changes in quality or qualitative effects are not included in the economic result. In some of the studies, benefits were described that were not given a monetary value. Examples of these are: increased security for health care personnel [32], saved time at the hospital [50] and enhanced expertise [47].

Perspective

The perspective that the economic analysis is made from, will influence the conclusions of the

study. Nine of the evaluated studies have a societal perspective. This means that costs and savings for all parties are included. Two of the studies analyse how investments in telemedicine will be cost-effective for a certain regional health enterprise. Costs that fall on other sections of society, for example patients and employers, are not included. [43, 53] One study analyses collective changes for the Regional Health Enterprise and the National Insurance Administration [50], while another has the perspective of the municipal economy [44]. Different studies that do not include the same cost carriers can not be compared.

3.3 Current projects that examine benefits

The examining and documenting of benefits continues. The Social and Health Directorate has started the previously mentioned “Benefits and documentation programme” that will secure documentation of the spread, development and benefits of initiatives after the IT-Strategy Cooperation 2007. The programme will make way for and implement documentation measures, evaluations and benefit analyses associated with measures and projects³. Several current projects financed by the Høykom⁴ programme will register benefits and results in regard to certain indicators, and Høykom has prepared it’s own report on current indicators [54]. Several research projects are currently underway, focusing on benefits. Below are references to some of these.

Guidance for eczema patients via Internet

The project develops concerns Internet-based guidance for parents with children suffering from atopic eczema. Parents are able to send information that contains both images and text to the hospital. Specialist nurses and doctors answer enquiries and offer guidance regarding treatment and give advice that is adapted to each child.

The study is a randomised controlled test. The study examines whether this type of guidance

³ <http://www.shdir.no/samspill/gevinst-dokumentasjon> 12.09.2005

⁴ <http://www.hoykom.no>

leads to an improvement in the quality of life for the children and whether the parents feel they are better able to control the child's condition. In addition, the study examines whether the service can lead to a reduction in the number of visits to doctors and admissions to hospital in relation to traditional treatments and if this is cost-effective. The project will be completed in December 2006⁵.

Ses@m for the nursing and care services

The project will develop a model for the use of telemedicine in the care and nursing sector, in which telemedicine shall be employed in sore treatment polyclinics, e-mail based guidance and electronic messages. In addition to the benefit-cost analysis, the effects on the working situation for the health care personnel and patient satisfaction will be studied. The project will be completed in July 2006⁶.

An economic analysis of electronic messages

The project will analyse the paper-based and electronic messages between the primary health services and specialist health services. The aim is to make an assessment of the most cost-effective form of information exchange and to calculate potential and realised benefits of adopting this form of information exchange. If electronic information messages are shown to be more cost-effective, then measures that will increase the use of such information exchange in order to realise potential benefits will be discussed. The project will be completed in November 2006⁷.

Telemedicine as a tool in the co-operation between specialist and primary

health care services – extended follow-up of persons with permanent physical disabilities

The project is run by Sunnaas Hospital Health Enterprise. The aim of the project is to improve the specialist health service's cooperation with the front-line services in the municipalities. The results of the project and experiences gained, and an economic evaluation will be summarised in the final report, that will be completed in May 2006.⁸

Net-based medication cards

In connection with the development of a net-based medication card system, research is being planned to investigate whether the use of such medication cards will give a better correlation between the GPs and the home care services' medication lists for common patients, whether health care personnel use less time to obtain and verify information about patients' medications and whether the number of medication-related admissions to geriatric departments are reduced. Furthermore, any reduction in the number of errors and "near-errors" in the home care services will also be examined, and whether the grade of seriousness of the errors registered will be changed. The research is expected to be completed at the end of 2008.⁹

Home-based follow-up of chronically ill patients

The project MinHelsestasjon ("My Clinic") has developed a concept of home-based health services in the form of training and follow-up of chronically ill patients. Patients with diabetes and COPD have, among other things, received individual and group-based training and follow-up by TV transmitted meetings and training videos. The final report has been made, and a scientific presentation of the results is currently in preparation.¹⁰

⁵ Project description: <http://www.telemed.no/index.php?id=242060> The Project Leader is Terje Solvoll, The National Centre for Telemedicine

⁶ Project description: "Ses@m Tromsø", National Centre for Telemedicine, 17.02.05. Project leader: A.-T. Lotherington, NORUT Samfunnsforskning

⁷ Project description: "The socioeconomic analysis of electronic information exchange", National Centre for Telemedicine. Project Leader: A.-T. Lotherington, NORUT Centre for Social Research

⁸ Information from Sunnaas Hospital HE, Anne Merete Driveklepp.

⁹ Information from Project Leader: Eli Larsen, National Centre for Telemedicine

¹⁰ The final report is: "The final report of MinHelsestasjon. A broadband-based infrastructure for home-based services". Project Leader; Tatjana Burkow, National Centre for Telemedicine

4 What does this report reveal?

The National Centre for Telemedicine experiences a demand for information on the benefits of telemedicine, by national and regional health authorities, and from others with duties and responsibilities within the health sector. In relation to the type of demand, documentation can be said to be somewhat limited, both nationally and internationally [55-57]. One reason may be that telemedicine is still a new research field, in which the use of technology and research are still under development.

4.1 Areas of benefit

Several analyses of qualitative changes associated with telemedicine have studied EPRs and electronic messages and their integration. The focus has been on the general practice and also on the specialist services. Later, the care and nursing sectors have also been considered. The main area of benefit has been more time made available for other tasks and increased quality of data, including updated information. Areas of benefit

for professional solutions are that patients do not have to travel, better professional treatment, health benefits via faster professional evaluation where “time counts”, better selection of patients in regard to further treatment, enhanced professional medical expertise and greater professional confidence, better access to specialists and more effective use of specialist expertise. Within psychiatry and e-mail based communications between GPs and patients the patient’s experience of self-command is presented as a valuable aspect and a way to increased health benefits.

Economic studies have mainly analysed specialist consultations employing telemedicine, but have also studied electronic information exchange and EPRs in the care and nursing services. Most of these studies find that travel costs are an area of benefit. Some studies focus on how avoided admissions and time saved for those offering treatment can give economic benefits. For electronic information exchange, savings on paper and postage, as well as time saved can be areas of benefit.

Documented areas of benefit

Economic	Qualitative	
Travel costs	Time for other tasks	Competence in medical disciplines
Number of hospital admissions	Data quality	Professional confidence
Time spent by health practitioner	Patients do not have to travel	Access to specialists
Paper and postage	Health benefit where “time counts”	Efficient use of specialist expertise
	Selection of patient	Patients’ empowerment

4.2 Possibility of generalisation

The results of the reviewed studies do not immediately lend themselves to generalisation. Considerations about potential benefits are included when they have been relevant and sufficiently substantiated. This is a method of expanding the relevance of the study's investigations. Further generalisation of results has been difficult within the framework of this assignment because, among other things, some of the results are context specific and because the premises for generalisation is not discussed or fully accounted for in the studies.

4.2.1 Methodological limitations

In general, the view of what is possible and relevant can vary according to who is expressing the view. Furthermore, the reason for this can vary, according to the social context. For example, in regard to specific professional solutions, the need will vary according to profession and patient category. In the same way, the task of integrating EPRs and electronic messages shows that different services have different requirements and premises in relation to current technology. To bring out qualitative advantages of certain solutions depends on analysis of specific conditions in certain social contexts, and the generalisation of results depends on methodological preparation. To some degree, the reviewed qualitative studies do not discuss their specific conditions and basic premises.

It is correspondingly difficult to generalise results from the economic evaluations. Each decision to introduce telemedicine based on these studies must be based on knowledge of situational conditions. The possibility of transference of conclusions from one place to another must be assessed in each and every case, because what is beneficial in one geographical or organisational context may not be beneficial in other circumstances. Furthermore, the purchase of equipment for pilot projects that are not made as a part of the health authorities purchasing schemes, may lead to higher costs than in the

case of planned purchases made within the authorities' pre-negotiated purchasing arrangements. This can influence the results of the economic assessments; however this issue is not discussed in any of the reviewed studies. In addition the price of accepted technology will often fall over time, at the same time as new technology is developed and offers new possibilities and higher prices.

Testing of telemedicine concepts has been in the form of pilot projects, and current research from Norway includes mainly smaller-scale pilot projects or services. Analysis of the effects of telemedical services in relation to routine management and large-scale management has not always been possible.

Situational conditions and the lack of studies where generalisation is possible makes it difficult to draw conclusions that telemedicine is cost-effective or reaches qualitative aims – however there is no basis for claiming the opposite. The documentation shows clearly that there are potential benefits; however the realisation of these benefits requires a certain scope of use of the services.

4.2.2 Lack of documentation?

Cases that are not documented can of course show a lack of benefits or potential for benefits. Another possibility is that the benefit exists, but has not been discovered in any examination or study. The benefits that do show up are dependent on what is examined and how the study is conducted.

Many telemedical projects have conducted pilot schemes and tests, whilst evaluation has mainly been concerned with the suitability of the technology. This can be due to the requirements of the instances in the field; in the first phase it was important to show the nature of telemedicine and its solutions. Subsequently, new issues emerged.

Furthermore, the current benefits shown are characterised by the fact that mainly pilot and

small-scale services have been assessed, and not services that are run on a large-scale with routine management.

4.2.3 Changes over time – influence on the benefits shown

It is not just the technology and costs that change over time – so do attitudes to, knowledge and use of the technology. These are circumstances that can mutually influence each other and influence which issues that will be relevant in connection with use of the technology. For example, in some areas the issue of whether the patient will accept the technology will be less relevant than before. Furthermore, professionals in the field are more confident in the use of the PC than they were in the 1980s. Parallel to this, the technological developments of the 1980s have developed further. In this way the concept of what is possible and relevant within telemedicine solutions changes. We are in the midst of continually evolving processes that influence the benefits available.

A look back at the authorities' expectations and aims for use of the technology in the health sector shows that in some areas, those aims have not been reached. For example, the electronic discharge letters does not leave the hospital at the same time as the patient [5]. At the same time the aims have changed and have to a certain degree become greater and more challenging. For example, the current expectations of EPRs are not what it was in the 1980s. The authorities' expectations and strategies are affected by and influence the aforementioned processes.

New challenges

The aims contained within the government white paper no. 41 (1987-88) [1] regarding integration and standardisation are supplemented by comprehensive integration efforts, reflected in the current S@mspill-plan [6, 7]. Isolated, the health service's division of functions and steadily greater differentiation make great demands. Gradually, more and more personnel groups, services and assignments are being added to the picture. In addition, other sectors such as care

and nursing and social security services have also joined, with their associated functions and participants. This leads to a complex organisational structure and complex requirements and interests.

The responsibility of the state to lead the way and to preserve unity must be managed within the demands of today's modern society. Its relationship to the medical system and the medical profession are relatively well-known themes. Furthermore, the desire for integrated, total and seamless solutions has highlighted new problem issues. The issue of information availability is a formidable one, i.e.; what are the practical issues and what are legal and political issues? This includes both the health service personnel's access to individual patient records [58] and to society's and research institutions' access to registers and statistics. (Cf. for example discussions concerning the Personal Information Protection Act and the Health Register Act.)

The above may, in one perspective seem like a slow process. However in another perspective it can be viewed as an expression of further development and absorbing of new challenges.

5 Conclusions and recommendations

Telemedicine has contributed to the realisation of the authorities' strategy for renewal, adaptation and efficiency of public management so that it may function more in harmony with the needs of the population and with economic issues. At the same time there is still some potential to be exploited in this new information and communication technology and within the current structure of the Norwegian Health Network.

Two main conclusions may be drawn from the review of the projects that have evaluated telemedical services:

- I The economic benefits depend mainly on the volume of use of the services. Often, this use is not great enough to realise the benefits of telemedicine, however if use of the services reaches a certain scale, the benefits will become apparent.
- II A number of studies show areas of qualitative benefits. It is more difficult to measure quality than money in a meaningful way and qualitative benefits are often hard to demonstrate. The ability to reveal advantages and benefits of certain solutions depends on analysis of specific social processes in certain social contexts. Generalisation of results assumes methodological clarification. To a certain degree, the analyses presented do not include clarification or discussion of their special terms and basic premises.

There is a demand for information about the benefits of telemedicine, but in relation to the demands the documentation can be said to be somewhat limited. This may be due to the fact that telemedicine is a relatively new research field, and that the use of technology and research is under development. Furthermore, the studies that have been made up until now satisfy only a few of the methodological require-

ments that make generalisation possible.

From an economic perspective it may be pointed out that few complete economic analyses have been made, i.e. analyses that include both economic and qualitative effects. Seen from a sociological viewpoint it may be said that few studies present complete sociological analyses, i.e. studies that include different types of relevant effects and analyse these in an explicit sociological perspective. It may therefore be concluded that there are no complete benefit analyses of telemedicine in Norway. A general challenge in the research field as it is today is the narrow range, so narrow that statistically significant conclusions are not achievable. The reason for this can be small populations and/or that the volume of the services is too low.

Along with the technological development, the authorities' aims for telemedicine have changed. Several more patient groups, functions and users are now included in the services. This makes it more complicated and cost-demanding to both realise and analyse the benefits. At the same time these are processes that can lead to several others observing the advantages of using the service and to realising of potential benefits.

There has been a necessary focus on technology during the development of telemedical services. There is also focus on social challenges, among them health and organisational challenges. This focus will require further development if the social benefits are to be illustrated more completely. The problem issue will be; which issues for the current and future health sectors require must be resolved – and how can telemedicine contribute in finding solutions to these issues?

Recommendations

On the basis of the main conclusion that the volume of use of telemedical services must increase in order for potential benefits to be realised, the following recommendations are made:

- I Analysis of the measures that can be taken in the health sector that can lead to greater use of telemedicine within the sector
- II Analysis of adequate management efforts for increased use of telemedicine, including for example providing the right arrangements so that those who have the possibility to use the services actually do so.

Regarding the first point, the documentation presented indicates that the focus should be on the terms and conditions for increased integration between EPRs and electronic messages. The benefits here are the release of personnel from time-consuming tasks and an increased level of quality of the medical documentation. It is assumed that both the hospital and the nursing and care services can receive benefits in the same way as the GP-offices. For professional solutions, the focus can be on the terms and conditions that contribute to less travelling for patients and on solutions that give faster professional assessment when “time counts”. Other possible benefits are the better selection of patients and better use of specialist expertise, as well as greater professional confidence for health care personnel, through enhanced expertise. Existing documentation for patient-oriented solutions shows that it is possible to contribute to patients’ experience of self-command through both communication between patients and between health care personnel and patients.

The report shows areas of benefits that are documented. It is important that there may be more areas of benefits, and that they will develop further in relation to both technology and social processes.

The second point includes everything from legal and financial frameworks to the administrative bodies’ guidelines and policies. Issues in connection with framework terms and conditions may be, for example, who is to be given access to information regarding the patient and who should be given economic advantages

and disadvantages of different solutions – e.g. in cases of decentralisation of services via telemedicine. Administrative issues can be, for example, whether management decisions include the use of telemedical solutions and if reports reveal whether telemedical solutions are effective.

Prioritising studies that place emphasis on developing the methodological approach in evaluating qualitative benefits is recommended. In order to achieve a better basis for making further decisions, studies should be commissioned that aim to integrate analyses of qualitative and economic benefits. Stimulation of development of new, relevant problem issues in the field is also recommended.

In future work a relevant perspective on telemedicine and telemedical services is needed, so that they can work both as aids to professional medical tasks, also as an administrative guide and as management tools for the authorities. The latter can also be used for the localisation of services, organisational division of functions and a prioritising of patients.

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Høykom supports broadband solutions in e-government and e-services

The Norwegian government intends to provide broadband access to all Norwegians by 2007. This is a substantial undertaking. Infrastructure suppliers, for example, must tailor their solutions to Norwegian conditions and reach into the country's most remote areas. The Høykom programme is one of the government's most important tools for overcoming such challenges and maximizing the benefits of market developments.

The Høykom programme is orientated to the public sector. There, an expanding broadband infrastructure holds the promise of enhanced public services and revitalized work routines. With Høykom at the fore, the government's progressive ICT policies encourage the development of innovative broadband-based services and operations at all levels of public administration.

The programme

Høykom has been the Norwegian government's central broadband initiative since 1999. The programme's objective is twofold: to stimulate public-sector demand for public-sector broadband services and to help revitalize public administration. The vision is "to initiate projects and disseminate the knowledge and skills Norway needs to be a leader in the innovative use of ICT and broadband services in every part of the public sector." Increased demand for broadband

access and services will stimulate new rollouts of infrastructure and technology offerings by private enterprise. Intervention by public authorities should be limited to areas and applications that the market is not expected to reach.

Since its inception, the Høykom programme has received about 1,100 project applications and has provided a total of some NOK 500 million to over 400 projects. Among the recipients have been 100 municipalities. From the beginning, the programme has enjoyed broad political support and has been explicitly referred to in the national strategy for advancing Norway's information society.

Knowledge development and dissemination

In addition to its role in funding projects, Høykom is a source of expertise. The Høykom reports are published to make knowledge developed within the programme generally accessible. The report series is based on work performed on assignment for the programme as well as analyses and memoranda by the programme secretariat and information submitted by projects that have received support from Høykom.

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