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Nordic eHealth Indicators

Organisation of research, first results and the plan for the future

Hyppönen, Hannele ; Faxvaag, Arild ; Gilstad, Heidi ; Audur Hardardottir, Gudrun ; Jerlvall, Lars ; Kangas, Maarit ; Koch, Sabine ; Nøhr, Christian; Pehrsson, Thomas ; Reponen, Jarmo ; Walldius, Åke ; Vimarlund, Vivian

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Hannele Hyppönen, Arild Faxvaag, Heidi Gilstad, Gudrun Audur Hardardottir, Lars Jerlvall, Maarit Kangas, Sabine Koch, Christian Nøhr, Thomas Pehrsson, Jarmo Reponen, Åke Walldius and Vivian Vimarlund

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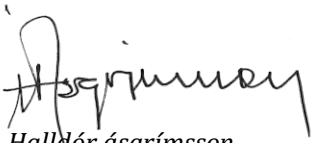
Preface

The Nordic countries share many similarities; culturally, politically and in the health care and welfare systems. The countries have a long tradition in collaboration in the health sector. All our countries have also progressed quite far in developing and implementing IT-systems in health care. Even though we have evident similarities also within health IT, there are also differences in policies, priorities and responsibilities for implementing health IT systems. This creates a fruitful basis for benchmarking and learning best practice from each other.

In 2010 the Nordic Council of Ministers invited the Nordic health ministries to set up a Nordic eHealth group, to bring eHealth higher on the Nordic agenda. All Nordic countries have participated in formulating the priorities for the Nordic eHealth group. One main priority for the group was to benchmark the deployment and use of health IT in the countries. Another priority was to prepare cross-border cooperation and projects. Comparable health IT benchmarking is necessary to target the content of common projects. A vital link has been established between the eHealth policy makers and researchers in the field. This has for the first time made it possible to jointly work towards measurable policy goals and provision of measurement data that can be exploited to steer decision making related to goals and their implementation – Evidence-based management.

This report has been produced by the Research Network, a subgroup within the eHealth group. Future work of the Nordic eHealth group and the Nordic countries will enable the collection of comparable health IT statistics, probably also achieving international comparability based on collaboration with the OECD Health Indicators work. These results will be important for continuing work on health IT policies, with the goal of the Nordic countries to be among the most advanced and efficient users of health IT systems in the world, supporting high performance health systems and increasing the quality and efficiency of care and services offered.



Halldór ásgrímsson
Secretary General
Nordic Council of Ministers

Abstract

The purpose of this report is to present a method and first results for an analysis of Nordic eHealth policies and common Nordic eHealth indicators. The report is a result of the first year's work of the Nordic eHealth Research Network, which was established on 15.2.2012 as a subgroup of the Nordic Council of Minister's eHealth group. The eHealth group gave the Network a Mandate that was signed for the period of the eHealth group, ending in early May 2013.

The work has been based on an indicator methodology containing four phases: 1) Defining the context (key stakeholders and the relevant area or system), 2) Defining the goals with a combination of top–down and bottom–up approaches, 3) Defining methods for indicator selection and categorisation, and 4) Defining the data, reporting results and feedback. The work proved the importance of following the methodology.

The context and goals were defined by analysing eHealth policies in four Nordic countries using content analysis, extracting three types of content from the documents: goals, stakeholders and measures. The stakeholders, policy goals or the systems for which indicators have been developed are not generally analysed in expert-led indicator approaches. The Nordic research group found that policy analysis was necessary in order to define common goals, for which common indicators would be needed. The analysis revealed that all policy documents contained statements about improving quality, effectiveness and the empowering of patients, as well as statements about information security, privacy, secondary use and improving access to relevant health information. Effectiveness statements were most prominent in the Danish document. The Swedish document laid more emphasis on using ICT as a tool to instigate change in healthcare organisations. Improving support for healthcare processes was most prominent in the Norwegian and Danish eHealth policies. Sweden and Denmark laid the emphasis on improving the usability of the systems, Finland on improving the IT-architecture. All policy documents described several measures to establish common IT-services: In relation to clinicians, this was most commonly described by Norway and Sweden, and for patients, most prominently in the Swedish and Finnish documents. Plans for standardisation were most prom-

inent in Finland, Sweden and Norway. Plans to enhance information security and privacy were most prominent in the Finnish policy document. Plans to improve access to data for secondary use were mainly mentioned in Sweden and Norway.

Key systems were defined by taking the OECD –defined key functionalities for Electronic Health Records (EHR), Health Information Exchange (HIE) and Personal Health Records (PHR) as starting points. The availability and use of these functionalities were selected as the first indicators. The national eHealth survey variables in different Nordic countries were compared with OECD definitions to find common availability- and use- measures for these functionalities. Additional specifications were needed in order to achieve comparability in the metrics. Specifications focused on levels of comprehensiveness, completeness and accuracy of data, integration levels of the functionalities and structures used. Statistics were collected to test the comparability of the three selected variables.

Analysis of the national eHealth survey contents in different Nordic countries provided a list of OECD-compatible EHR, HIE and PHR functionalities, for which availability or use data exists in the current survey results or in log data in different Nordic countries. The report demonstrates pilot data collected for availability and use of three functionalities from existing sources, showing the extent of comparability of current data.

By mediating the results to the OECD eHealth indicator work, the Nordic eHealth Research Network has participated in formulating the OECD eHealth indicators. Co-operation has been close between the Nordic eHealth group and organisations responsible for the national eHealth surveys in developing compatibility between the Nordic surveys. Future work entails generating a long list of eHealth indicators beyond those that are currently available for the key eHealth functionalities. Survey questions, policy goals and literature will be analysed in this regard, and indicators will then be prioritized according to top-down and bottom-up processes. Data will be collected to demonstrate comparable Nordic eHealth indicators.

It is not possible to develop good indicators, unless the definitions of systems/functionalities are clear and unambiguous. Even in the Nordic countries, where eHealth systems are relatively similar, challenges in data comparability have been encountered. These cannot be overcome with existing data collection measures, which calls for a redefinition of data collection instruments. The challenge of the work being done is that it presents a snapshot of documents given to the Network. The policy documents and survey questions are frequently revised, leading to

changing emphasis in the content. A mechanism is required for updating the main goals and indicators.

Future work that is needed also includes moving from availability and use to output and impact indicators (organisational, clinical, economic etc.). Key stakeholders need to be involved in rating the importance of detected indicators. There is a need to access statistical and log data to measure availability, use and outcomes in order to move towards the most reliable and automatic indicator data collection. eHealth indicator work needs to be integrated into the mainstream health indicator work. Agreements on the use of log and statistical data for eHealth monitoring purposes need to be established. Already in current work, the preferred data source for each question should be pointed out clearly in order to judge the reliability of data. A shared repository for common indicators and questions is needed to maintain the current indicators and updates to be implemented in Nordic countries. Collaboration with the OECD as well as the Nordic eHealth group is needed to ground the indicator development to those activities where results are needed. It is important to further enhance collaboration in the Nordic work and the OECD HIE and PHR task forces.

Keywords:

- Medical Informatics.
- Electronic health records.
- Benchmarking.
- Health Care Policies.
- Policy Compliance.
- Quality Indicators.
- Health Status Indicators.
- Cost Benefit.
- Strategy analysis.

1. Introduction

Access to good quality care, equity, and solidarity are values shared across health care systems in Europe. All European Union health systems also aim at ensuring patient-centred healthcare provision that is responsive to individual needs, while also aiming to make the systems financially sustainable. A shift in focus towards preventive measures is expected to reduce the cost burden by avoiding the occurrence of disease and its associated treatment costs. (Ref. no. 1)

To meet these goals and challenges more effectively, eHealth is envisioned as a key enabler. (See Glossary for concept definitions.) The European Commission has invested in eHealth research for over 20 years. Since 2004, targeted policy initiatives have been developed by the Commission that are aimed at fostering widespread adoption of eHealth technologies across the EU: In 2004, the European eHealth action plan initiated a commitment by all EU member states to develop a national or regional roadmap for eHealth. (Ref. no. 7).

Member States have been taking a complementary and pro-active approach to eHealth in parallel to the Commission activities. The Nordic countries are no exception – quite the contrary: they have pioneered the introduction of information technologies in healthcare (eHealth). eHealth policies have been published in different Nordic countries since 1996 (Ref. no. 8). Most policy makers in the Nordic countries develop new eHealth policy documents on a regular basis.

The diffusion of eHealth rapidly increases the importance of monitoring the progress and impacts of eHealth policy implementations so as to learn from the initiatives. For this, adequate valid indicators are needed. A recent survey of national eHealth assessment and evaluation policies revealed that by 2007 most EU Member States had a documented policy on eHealth, but it was still rare to find documented follow-up and evaluation policies that assessed whether national level systems have reached their set aims and outcomes. Among EU Member States, only the UK was found to have launched national level evaluation. (Ref. no. 9) The pioneering status of the Nordic countries in eHealth implementations and the fact that Nordic countries have similar health care systems both facilitate cross-country learning from eHealth implementations. For this, it is necessary to be able to compare the implementations as well as their

impacts (c.f. (Ref. no. 10)). Nordic countries participate in eHealth indicator work in the OECD context, further increasing the need for internationally comparable data.

However, to date, there are no agreed common measures for monitoring eHealth, and the connection between existing measures and policy goals remains obscure. The situation is similar across the whole European Union area: the eHealth ERA project surveyed the European Union Member States eHealth policies in 2006 (http://www.ehealth-era.org/). Only a few had detailed documents outlining concrete eHealth goals or their measures. An update to the report stated that this number had increased by 2011. The scope and procedures used for evaluation were very diverse, and a systematic comparison of approaches, techniques/tools applied and specific applications or processes evaluated was not possible. (Ref. no. 11).

1.1 Report structure and intended readers

There are three main sections in the report. The Introduction (Chapter 1) reviews previous eHealth research in the Nordic context, and describes national eHealth surveys in the Nordic countries. The background and reasons for the establishment of the Nordic eHealth Research Network as well as the Network objectives and OECD collaboration is here described. The Methodology (Chapter 2), describes the adopted eHealth indicator methodology, and the Results (Chapter 3) the first results in its implementation in the Nordic eHealth indicator context. Background, methods, results and conclusions from the two main tasks – policy analysis and indicator definition – for the first period of the Network are described in the Results chapter. Chapter 4 describes the conclusions of the overall work, a summary of the key results, the limitations, recommendations, and the future work needed.

There are four intended audiences for the report. For the Nordic and international eHealth policy and decision-makers, the report offers a review and benchmarking of eHealth policy goals (needed for policy updates), as well as information on best Nordic practices. This user group gets information on existing indicators with limitations in their comparability between the Nordic countries, as well as on strategies and methods to define new comparable indicators and connecting monitoring activities to eHealth policy goals (needed for evidence-based policy updates).

For the Nordic and international research communities that monitor and evaluate eHealth systems and services, the report offers the first

results of testing the eHealth indicator methodology, which was published in collaboration with EFMI and IMIA evaluation working groups (Ref. no. 13). The first common Nordic indicators with the necessary specifications to provide comparable data are illustrated: availability and use of a comprehensive medication list (as an example of EHR-functionalities), availability and use of the electronic transmission of prescriptions (as an example of HIE-functionalities) and the availability and use of direct internet booking of health services (as an example of PHR-functionalities). The report also provides a method for mapping the data collection against national eHealth policy goals, in order to ground the indicators to the activities and goals they are intended to monitor. The report thus helps research organizations to develop surveys geared towards policy relevant data collection. The Nordic organizations that collect national monitoring data as members of the Nordic eHealth Research Network are the first research communities exploiting the results. The results will be brought to the scientific community for review and discussion so as to validate the methodology and the first results scientifically. Dissemination channels include the Nordic Council of Ministers website (http://www.norden.org/en/nordic-council-of-ministers), the Research Network website (www.thl.fi/nordicehealth), the EFMI and IMIA evaluation working group websites, OECD eHealth task forces, conference presentations, as well as scientific journal articles.

For the OECD eHealth indicator task forces, the report will offer a description of the indicator methodology and test results of the first OECD-defined eHealth indicators, with the specifications needed to provide internationally comparable benchmarking results.

1.2 Previous eHealth research in the Nordic context

This chapter reviews previous eHealth research conducted in the Nordic context, as well as international eHealth benchmarking work, where the Nordic countries are included. The chapter concludes with a description of the current national eHealth monitoring activities in the Nordic countries.

1.2.1 Nordic benchmarking on eHealth

Nordic countries have had a long tradition on learning from each other and benchmarking in issues related to Health. There is a natural continuum that has extended collaboration to eHealth issues, since all the Nordic countries have been forerunners in adopting information technology.

They also share the same standards in health care delivery and medical education. Common methods for exchanging experiences have extended from informal visits by national delegations, to joint projects, and to information exchange in seminars and conferences. The Nordic Council of Ministers and Nordic Innovation Centre have also published some reports where there is information on eHealth services in the Nordic countries. Also some EU and OECD-level reports have presented benchmarking results where the Nordic countries are included. The actual data for these reports comes from different questionnaires constructed for international reporting purposes.

There is a long tradition of Nordic research collaboration in the form of organizing Nordic Conferences on Telemedicine. The first conference in the series was held in 1996 in Kuopio, Finland. The conference was jointly organised by the Finnish Society of Telemedicine, the University of Kuopio, and telemedicine groups from various Nordic countries. It was agreed that the Conference will be arranged biannually, rotating between the different Nordic Countries. In 1998 it was organized in Reykjavik, Iceland; in 2000 in Copenhagen, Denmark; in 2002 in Tromsö, Norway; in 2004 in Umeå, Sweden, and again in Helsinki, Finland in 2006. The purpose of the conference series was to bring together scientists, developers and users interested in telemedicine, from each of the Nordic Countries on a regular basis to share development ideas and experiences. (Ref. no. 14)

The first Nordic Council of Ministers report into telemedicine, the predecessor of eHealth, was published already in 1998. It was a basic survey of eHealth-related telemedicine projects and services in 1998. The information was collected by Dr Thomas Stensgaard from Greenland (Ref. no. 14). In 2004 the Nordic Council decided to conduct a second survey on the use of IT support in the health care and social sectors in the Nordic countries. A report was published in 2005: ”Health and Social Sectors with an “e” – a study of the Nordic countries” (Ref. no. 10). The report presents a short description of eHealth policies in the Nordic countries, as well as the European-level development. The report includes descriptions of co-ordination measures taken within each country to alleviate the barriers related to eHealth co-ordination. IT developments for specific needs, infrastructure developments, security issues and health information exchange issues in different countries were described. Concrete collaboration activities were listed, e.g. the Nordic Centre for Classifications in Healthcare, Harmonisation of EHR Architecture, the Collaborative Network of Nordic eHealth Competence Centres, to name a few. The report concluded that the Nordic countries are at the

forefront in eHealth development, and to assess the full potential of eHealth, it was clear that collaboration and benchmarking were needed. Indicators should be developed that make it possible to assess and evaluate progress in the countries in a compatible way. This would yield useful information about country-specific achievements and show where useful lessons can be learned from others.

A study by the Nordic Innovation Centre, an institution under the Nordic Council of Ministers, was published in 2009 (Ref. no. 15). It summarised results of a feasibility study on the potentials and barriers towards an open market for health services in the Nordic countries. The report is important for indicator work, since it describes cross-border health information exchange functionalities, eHealth policies, and potential benefits as a basis for common indicators. The report stated that Nordic initiatives on eHealth include ePrescriptions, consultation from specialists via video conferences, electronic and transferable charts. It was stated that increased use of ICT in the everyday work of caregivers has 1) improved collaboration between health care personnel by making them more accessible to their colleagues at other hospitals, 2) provided better access to knowledge 3) increased accessibility of services to patients in these areas, 4) reduced patient travelling costs, 5) enhanced productivity, 6) made the process of correct treatment faster and more secure. These effects are interesting from a national perspective as well as from Nordic collaboration in care, where the report anticipated even bigger gains. The forum behind the study underlined that eHealth in the future should be part of both national and Nordic health care policies. Furthermore it was underlined that the implementation of eHealth should not be seen as a goal in itself, but rather as an instrument to improve the general level of health care services provided. Lastly the report emphasised that the organisation of cross-border eHealth services in the near future should be part of national policies. There exist still large technological, organisational, economical and legislative challenges that have to be met and overcome in the future to realise the full benefits of eHealth. In particular, higher integration between the national health care systems is needed for cross border eHealth to be successful. Second, increased rights to access patient files, registers and catalogues across borders are needed.

Scientific reporting on comparisons of eHealth systems and services in the Nordic countries has, on the other hand, been rare.

Table 1 Checklist for comparison of eHealth development in the Northern periphery countries (Ref. no. 16)

eHealth activity checklist	
Owner	
Developer	
Country of origin	
Cost of the service	Start-up costs
	Maintenance costs
	Operational costs
	Who does the work?
Target group and area	Who is the service for
	Who is involved in providing the service?
Description of eHealth service	Purpose of the service
	How does service work?
	How is service used?
Description of test/ evaluation conducted	Test results
	Level of job-fit
	User and provider evaluation
Commercial use	Is it in commercial use today?
	Service length of use?
	Track record?
Advantages	
Disadvantages	

Three of the ten top hits for an internet search with the keywords "eHealth" and "comparison" and "Nordic" produced links to the Nordic Research Network (depicted in this report). Two hits were not relevant, and four reflected administrative or project reports or other types of "grey literature." Only one recently published scientific article (Ref. no. 16) was included within the top ten hits. The article describes the extent of eHealth development in sparsely populated areas of four northern periphery countries. Data were extracted from a wider project, part funded by the European Union (European Regional Development Fund) through the Northern Periphery Program (NPP).

Table 1 illustrates the dimensions of eHealth services that were compared. The study focussed on comparing the availability of Electronic Patient or Health Record (EPR or EHR) systems and picture archiving systems across the studied countries (including Scotland and Ireland), also listing other available eHealth services per country per medical speciality. The study identified a variation in eHealth infrastructure within the selected countries, and concluded that there is clearly great potential for productive knowledge transfer on eHealth solutions amongst the partners in the study.

1.2.2 International eHealth benchmarking activities including Nordic countries

The OECD aims at developing a modular eHealth indicator set with a model questionnaire. The aim is that each member country provides data to the extent that they have it. The OECD is not conducting surveys to collect the data; each country uses their existing data sources to provide data to the OECD. The challenge is that the member countries have very different health care and eHealth systems, and developing a common understanding on the eHealth indicators to be included in order to provide compatible data is not easy. To tackle the challenge, task forces to develop indicators within each of the modules were established after the initial meeting in Paris on 30-31.1.2012. (Ref. no. 39) Results of the task forces were presented in Paris on 29.11.2012 in a meeting of task force leaders.

There are also international eHealth surveys being conducted: EU/INFSO has conducted a survey of primary care ICT use, with plans to repeat the survey. The data used for the previous report were collected by means of a survey of primary care physicians and their use of ICT for eHealth purposes. The pilot survey was conducted in 2007 as Computer-Aided Telephone Interviewing in all 27 Member States of the European Union and in Norway and Iceland. A random sample of practices/institutions with a quota on region was drawn, resulting in 6,789 interviews. There were questions about availability and use of computers in storage of patient data and in consultation, availability and use of the internet, availability and use of the electronic transfer of patient data, attitudes to eHealth, and perceived impacts. (Ref. no. 17). This work entails similar challenges to the OECD-work, but a weaker mechanism to overcome them with international agreement procedures. In addition, the data collection requires a laborious mechanism for focusing on single user groups/contexts at a time. The survey does not exploit data already routinely collected in different countries.

In 2005, the WHO Global eHealth Observatory (GOe) conducted two surveys. They focused on issues relating to processes and outcomes in key eHealth action lines previously identified by the World Summit on the Information Society (WSIS) and WHO. They surveyed policies and strategies, infrastructure and other implementations, access to information, human resources, national eHealth centres, and eHealth systems and services. The survey on eHealth systems and services focused on the perceived usefulness of WHO-developed prototype eHealth tools and services for member states. The survey was conducted by the WHO representative in each country, and targeted up to seven eHealth experts within coun-

tries. The work has continued since 2005, with plans for new data collection (Ref. no. 18, 19). This survey has previously focused on experts' knowledge and more on a generic policy level, not on availability, use, usability and impacts on different eHealth functionalities.

As a conclusion, there are several international eHealth benchmarking activities that use different mechanisms for collecting different data and that focus on different informants. To our knowledge, only the OECD relies on data routinely collected from the national surveys. It seems like a cost-effective way for generating international benchmarking data for concrete eHealth functionalities, since many countries already collect the data routinely for monitoring their own progress. However, the national survey variables and their metadata need to be developed in order to provide internationally comparable results.

1.2.3 National surveys in the Nordic countries

At present, there are national level monitoring activities for eHealth in all the Nordic countries – in Finland (Ref. no. 20, 21), Sweden (Ref. no. 22, 23), Norway (Ref. no. 24) and Denmark (Ref. no. 25, 26, 27). What is missing is harmonisation of data content for Nordic benchmarking and learning, and systematic connection of monitoring activities to eHealth policies.

In Denmark national surveys have been conducted from 2001 to 2007, and again from 2010 to 2012 (Ref. no. 26). In the first period a questionnaire was sent to the hospital owners – the counties – asking them how many beds were in the hospitals and how many were covered by an EHR system (electronic clinical documentation and medications management). The bed coverage increased from 7% to 20% in this period. A new survey started in 2010 where the clinical users (n=5-8000) are addressed directly to get a more reliable picture of what systems are actually used and how they are used. The survey addressed nurses, medical secretaries and medical doctors as the primary clinical users of health information systems. A questionnaire with sections on 1) demographic data, 2) the actual IT system used: number of log-ins during a work day, number of usernames and passwords, how long they spent every day using the computer, which information systems they used, and how frequently they used them. The study has been repeated in 2011 and 2012 (Ref. no. 25, 27). The studies depict the actual use of the 14 most common systems, and show a decrease in the number of log-ins per day and the number of usernames and passwords, indicating a slowly increasing level of system integration (Ref. no. 25).

In Norway, national surveys were conducted in 2008 and 2010 (Ref. no. 24). The 2008 survey was directed towards primary care physicians, municipalities, hospital administrators and IT-departments and mostly explored implementation status, integration, cost, and maintenance and upgrade issues. Apart from the municipalities, all parts of the sector had implemented and started using an EHR system. From inception, it took 20 years to implement an EHR system in all hospitals. In GP offices, the adoption curve was slightly steeper. The 2010 survey focussed on clinicians' use of EHR systems and on the use of these systems for health information exchange. The survey revealed that the work of primary care physicians was tightly integrated with their EHR system. Electronic interchange of a wide variety of referral documents, orders, reports and other messages was on the rise. Primary care physicians had established IT-services for patients (e.g. scheduling of appointments, SMS-based reminders, renewal of prescriptions and electronic dialogue). In hospitals, work with EHR systems had largely replaced the old paper-based workflows. Hospital EHR systems were better at supporting stationary work (e.g. in a doctors' office at an outpatient clinic) than bedside work on the wards. To some extent, mandatory access control mechanisms impeded the work.

A national survey has been performed once a year for the last 12 years in Sweden by the SLIT group (IT Strategists/IT Managers/CIO´s in the County Councils) (Ref. no. 22). The results are reported in a yearly report entitled eHealth in Swedish County Councils, which provides data for comparisons and benchmarking between the county councils in Sweden. The questionnaire contains more than 100 question areas and covers issues relating to EHR, IT systems for other types of medical documentation, IT support for managing pharmaceutical products, ADT - IT support for patient administration, IT support for medical services, IT support for collaboration between municipalities and county councils , and e-Services for patients and citizens. The data that is collected for each area are on fulfilment (i.e. the level of progress in the introduction of systems in relation to the county councils' level of ambition), systems, suppliers, management type, etc. For EHR-systems, data are also collected on the number of users per system. All county councils (n=21) in Sweden answer the survey. The main contribution of the results obtained from this yearly survey are the possibility to compare the evolution of the use of the systems, the type of system used in each county council, how the systems are used and managed, the utility of the systems for the organizations, the possibilities the systems offers i.e. for administrative, organisational and/or clinical issues, as well as the strength of the systems to support

collaboration between municipalities and county councils, and to deliver e-services. SLIT can deliver data for "availability" and partially for "system use." Sweden lacks a strategy for capturing or monitoring IT benefits and extent of "system use." In addition the Department must take the initiative so as not to become dependent on surveys that are conducted with different content, definitions, ambitions, goals and clients, which makes them ineffective for national monitoring of development over the time.

In 2004, the Swedish Health IT Map (Vård IT-kartan 2004) was carried out by the four health care unions and the union-owned development company UsersAward, with support from VINNOVA (Swedish governmental agency for innovation systems). A questionnaire was sent out to 1800 health care workplaces and the survey amounted to the first comprehensive investigation of who worked with what kind of ICT in the Swedish health care sector and how satisfied they were with their ICT systems (Ref. no. 28). A follow-up was made through the Health-IT-Report 2010 (Vård-IT-rapporten 2010). This survey was sponsored by VINNOVA, the health care employer organisation (SKL, Swedish Association of Local Authorities and Regions), and the four professional health care societies and unions (Swedish Medical Association, Swedish Association of Health Professionals, SKTF/Publicly and privately employed salaried employees and Swedish Municipal Workers' Union) (Ref. no. 23). The survey covered 1368 respondents from all four major professions; it was conducted in co-operation with SCB (Statistics Sweden) and supervised by the UserAward research panel with researchers from KTH, Uppsala and Linköping University. The survey focused on time spent with IT systems, the kind of systems used, usability aspects, impact on work patterns, changes in IT environment during last three years, and respondent estimates of time saved through IT use, and the potential for improved efficiency in terms of time saved through optimal use of the IT systems.

Two national level surveys have been implemented in Finland. A nationwide survey on the implementation and use of eHealth (Ref. no. 20) was conducted for the first time in 2003. It showed the current situation before the onset of the National Project for Securing the Future of Health Care. It was repeated in 2005, showing the progress halfway through the National project, in 2008 and at the end of 2010. It has been directed to the chief information officers and chief medical officers in all public primary health care organisations (N=140 in year 2011, and all secondary care organisations (N=21 in 2011), as well as to a sample of private care providers (N=31 in 2011). The latest 2010/2011 survey describes the situation at the launch stage of the national eArchive ("KanTa") and

ePrescription services. The questionnaire has surveyed the availability and extent of use of eHealth systems and services, standards in use for the migration of patient information, methods of authentication, identification, and informed consent of patients; the age of the application, different e-Education systems for staff education; types of human and material resources needed; systems supporting quality control and service delivery, and the adaptation of different e-Services for patients.

The second national-level survey in Finland has been directed to all practising doctors in Finland. It was conducted for the first time in 2010, before launching the national eArchive (KanTa) and ePrescription services (Ref. no. 29, 21, 30). The questionnaire surveyed all practising doctors for their experience of system and information quality, usability of electronic health records and health information exchange, and experience of benefits of eHealth systems. The response rate was 31% (sample representative of the population). This survey used the concept of contextual usability and the IS success frameworks as a basis for constructing survey questions.

National eHealth surveys have not been conducted on a regular basis in Iceland. The country is relatively small and as the promotion and co-ordination of Information Technology within public health institutions has been the responsibility of the Ministry of Welfare (former Ministry of Health and Social Care, until March of 2012); there is knowledge on EHR use at the hospital level and within primary health care. Among projects launched under the auspices of the MoW are the implementation of an electronic health record system within primary health care and an admission-discharge-transfer system within hospitals in Iceland, a nationwide ePrescription system, a centralised immunisation database, and other projects in relation to data sharing at a national level. However, there is a knowledge gap in EHR adoption within the private health care sector and nursing homes. In 2008 the MoW conducted a national survey on EHR usage in health care. The return rate was approximately 64%, however only half of private practice offices returned the survey and even less of the nursing homes. In 2011 a national survey among nurse managers was conducted in all hospitals in Iceland (Ref. no. 31), collecting data using the Nursing Management Minimum Data Set. Results indicated a lack of availability of administrative data, and highlighted the need for a standardised, accessible system to collect management data in hospitals in Iceland for benchmarking. As of March 2012, the Division of Health Information Management within the Directorate of Health is responsible for the development, co-ordination, and implementation of an electronic health record (EHR) at a national level.

1.3 Establishment of the Nordic eHealth Research Network

The Nordic eHealth research collaboration started through the networking of Nordic eHealth researchers in 2009. National level monitoring activities in all Nordic countries were compared and a need for joint indicators stated. A joint workshop for the initial mapping of concrete indicators was held at the Medical Informatics Europe-conference, MIE 2011, Oslo, in collaboration with the the working group "Assessment of Health Information Systems" of the European Federation of Medical Informatics EFMI (http://iig.umit.at/efmi) (Ref. no. 12). A methodology for indicator definition was generated in collaboration with the IMIA Working Group on Technology Assessment and Quality Development and the EFMI Working Group on Assessment of Health Information Systems (Ref. no. 13).

A kick-off meeting for the concrete Nordic collaboration activities was organised in February 2012 in Helsinki. The Nordic Council of Ministers (NCM) eHealth group was invited to participate. The eHealth group found the work important, and offered the Research Network support in the form of a formal position and mandate as a subgroup of the NCM eHealth group (Annex 1). With the Mandate, each ministry in the Nordic countries, Greenland, the Faroe Islands, and Aaland was given responsibility for appointing national representatives to the Nordic eHealth Research Network. Finland's National Institute for Health and Welfare was given the responsibility of managing the Nordic eHealth Research Network.

The participants were selected to represent organisations responsible for the national surveys, whereby the link up to share understanding of national survey variables and also to mutually agree updates to the surveys would be immediate. In Finland, collaboration between the University of Oulu and THL for collecting national monitoring data had already existed, as well as a link between policy implementation and monitoring, which are both responsibilities of THL in Finland. In Norway and Denmark, the Network members are also research organisations responsible for implementation of the national surveys.

In Sweden, a close collaboration between SFMI and CeHIS has been established. CeHIS conducts the annual national surveys in Sweden. The information that accumulates in the Network is distributed to all SFMI evaluation working group members. All the members are asked to actively participate in commenting on all the documentation produced in the Nordic Network. SFMI also organises seminars and workshops to distribute and share information about what is going on in the Network. The report

draft has been distributed to all members interested in following the evolution of this work, while their opinions and comments have been considered and included.

Table 2 Organisation of the Nordic eHealth Research Network

Nordic Council of Ministers eHealth group **The Nordic eHealth Research Network managed by Finland's National Institute for Health and Welfare (THL)**		
Country	**Responsible Party**	**Participants**
Denmark	Aalborg university	
Finland	National Institute for Health and Welfare (THL)	University of Oulu, Finn Telemedicum
Iceland	Directorate of Health, Health Information Management Department	
Norway	The Norwegian University of Science and Technology (NTNU)	
Sweden	Swedish Federation of Medical Informatics (SFMI)	The Center for eHealth in Sweden (CeHIS)
Greenland	See annex 7)	
Faroe-Islands		
Aaland		

Iceland joined the Network in August 2012. Since the mapping of the surveys against OECD indicators and an analysis of eHealth policies was well under way by then, an analysis of the Icelandic eHealth policy was included as an Annex (Annex 4) to the report. It used the same structure of policy analysis used in this report. In Iceland, the Directorate of Health is the responsible institution in the Network. It has access to national surveys which have been conducted in Iceland. Moreover, the Directorate of Health is responsible for the co-ordination and implementation of projects related to EHR-implementation and health care data standards at a national level.

A representative from the Government of Greenland has also stated that they find the Nordic effort to monitor eHealth activity very interesting (Annex 7). They have a special interest in telemedicine and EHR implementation, and spend significant resources on such initiatives. However at this moment they do not possess any research capabilities to perform national surveys, but the Nordic eHealth Network will offer their assistance to conduct a monitoring survey in the future.

1.4 Aims and objectives of the Research Network

The main aim of the official network of research organizations within the Nordic countries as stated in the Mandate is to develop, test and assess a common set of indicators for monitoring eHealth in the Nordic countries, Greenland, the Faroe Islands, and Aaland, for use by national and international policy makers and scientific communities to support development of Nordic welfare.

The work plan was built to reflect a sound methodological and conceptual framework (Ref. no. 13) in order to maintain transparency and the scientific standard of the work. The work plan was broken into a short-term plan for the first year and a subsequent plan for the next years, to accommodate the mandate period of the eHealth group.

The work plan for the first year consisted of two key tasks and the managerial tasks including dissemination activities. The two empirical tasks were 1) an analysis of Nordic eHealth policy documents and 2) testing the comparability of Nordic survey data in relation to the availability and use of OECD-defined key functionalities. The plan with the timelines for these activities was as follows:

- Monitoring attainment of national eHealth policy goals: Policy analysis for defining the context (human and environmental) for measurement. (Lead NTNU, first results 7.5.2012, verification by 18.9.2012).
    - Identifying key stakeholders – users of indicator information and their needs.
    - Defining the goals for measurement per stakeholder group.
- Testing of data collection of the OECD-defined key EHR-, HIE- and PHR-functionalities (Lead THL).
    - Building a demo of OECD indicators from existing Nordic survey/log data (first results 7.5.2012).
    - Extending the demo with two additional functionalities (updates 18.9.2012).
- Management, dissemination and reporting the findings in a publication due on 31.3.2013.

It was decided to collate the outcomes and experiences gained during the first year into a single document to be offered to the Nordic Council for publication. The key outcomes are:

- Strategic building and establishment of the Nordic eHealth Research Network for grounding the indicator work to the practices for which indicators are being developed. The description serves as a Nordic model for other countries, who wish to develop national eHealth indicators. This outcome is described in Chapter 1.
- Validation of the 4-phase indicator methodology. The methodology is described in Chapter 2.
- Preliminary policy analysis results, described in Chapter 3.
- Indicator analysis results with first common Nordic eHealth indicators, described in Chapter 3.

1.5 Nordic Network and OECD eHealth indicators group collaboration

In parallel to preparation of Nordic researchers' collaboration, the OECD had undertaken measures to help countries move towards a consensus on an approach to benchmark ICT use for healthcare. Already in 2007, the OECD had undertaken a survey of countries' monitoring and evaluating activities related to the adoption and use of Information and Communication Technologies (ICTs) in the health sector. The conclusion was that national and international data on health ICTs were often not comparable for statistical reasons, including the use of different sampling techniques and definitions, and the scope of the surveys. One of the outcomes of this work was that the OECD Health Committee expressed its support for work to develop a model survey on ICTs in the Health Sector. In the Barcelona meeting held in 2010, a consensus was reached on a subset of the indicators and that it would be useful to organize these measures according to the following five categories or steps: 1. Availability, 2. Modes of Use/Purpose of Use, 3. Critical Success Factors, 4. Outcomes/Impacts, 5. Population Health. The participants of the Barcelona meeting also agreed that achieving consensus on standard measures would become harder as the indicator type moved from availability to population health, and therefore the work should start with availability and use (Ref. no. 39).

In January 2012, one month before the establishment of the NCM eHealth Research Group, the OECD held an international eHealth benchmarking workshop in Paris, focussing on indicators for the adoption and use of information and communication technologies in the health sector. There were several background documents prepared for this meeting that outlined the issues associated with measuring ICT

availability and use in health care; the documents compared some of the disparate sources and data on the subject within seven OECD countries, reviewing lessons learnt about the challenges in making measurements, assessing existing indicators and statistics in terms of the methodologies and definitions used, and considering the quality of the data available. Among the documents presented was a framework for the selection of internationally comparable indicators and statistics for benchmarking health ICT availability and use internationally, along with recommendations as to where international action and future efforts on measuring health ICTs might be best directed. This document was authored by Dr. Ashish Jha, Dr. Julia Adler-Milstein, G. Cohen and A. Widge (Harvard, United States), who had worked closely with the OECD Secretariat (E.Ronchi) and national representatives of the seven countries reviewed in the study (Australia, Canada, Denmark, England, Finland, the Netherlands, and the United States). (Ref. no. 39).

In the January meeting of the OECD, the Finnish and Danish OECD eHealth-representatives proposed that the Nordic research group work could act as a test bed for the OECD indicators and give feedback to the OECD about the development of the OECD eHealth indicators. This proposal was discussed in the grounding meeting of the Nordic Network and was supported. It was agreed that the Nordic Network would prepare a demonstration to WoHIT 2012 (held in Copenhagen on 7-9.5.2012) on how the Nordic data could be used to compare the availability and use of those EHR-, HIE- and PHR-functionalities that the OECD working group had identified as the most important. Thus, the OECD-defined key eHealth functionalities and their availability and use were taken as the starting points for the Nordic eHealth research group work.

The demo was presented as agreed, with actual data from the three previous years for one of the indicators (availability of a complete medication list), with all the necessary metadata and definitions. The demo was presented for different audiences – for the NCM eHealth group, which had invited Elettra Ronchi from OECD to visit the meeting, for the Norwegian national delegate, and for the Finland Plaza audience. It was also used to generate feedback to the OECD about problems encountered and further definitions needed for the functionalities to be compared when preparing the demo. The main concerns raised in the demo were to ensure that the maturity level of the functionalities would be adequately described for a comparison of the functionalities, and that the quality of information would be comparable (when measuring information availability). The work was regarded as very important by the OECD delegate, and an invi-

tation was made for collaboration between the OECD eHealth indicator work and the Nordic eHealth Research Network.

In June 2012, the OECD established task forces for EHR, HIE, PHR and Telemedicine indicators. It was agreed that the Nordic research group continues collaboration with the OECD by commenting on the OECD task force results, and that the OECD-eHealth indicator work is used to direct the work of the Nordic research group, in the form of testing the proposed indicators. The EHR-task-force is lead by Päivi Hämäläinen from THL, Finland, who together with Hannele Hyppönen act as a liaison to the OECD EHR task force. Michiel Sprenger from the Netherlands chairs the HIE task force, and Kristian Skauli as a task force member and Research Network mandate signatory representative acts as a liaison between the Network and task force. Jeremy Thorp from the UK chairs the PHR task force, and Christian Nohr as a member of the task force and the Research Network acts as a liaison between these two groups. Jennifer Zelmer from Canada chairs the Telemedicine task force, which is the only group with which the Network did not have a liaison with in 2012.

For the EHR task force, the Nordic research group has commented on the draft OECD model survey and metadata descriptions, as well as provided the key learning points from the Nordic surveys to the OECD Task Force leaders meeting in November 27–28. The HIE task group has progressed slower, and they did not provide any documents by end of October 2012 for commenting. The same applies for the PHR and Telemedicine Task forces.

The November 2012 OECD task-force leaders meeting processed the current version of the OECD model survey. Following the meeting, the results were compiled together into a single model survey document with all the different parts of the model questionnaire in the same document. The OECD group seeks feedback from the Nordic group as well as the task-force members. The final workshop of the OECD/EU for discussing the questionnaire/indicators runs from April 2013 18–19 in Brussels. Several members of the different task force groups have expressed their interest in giving feedback to the whole document, so there will be some cross discussions of the material during the first part of 2013.

2. Methodology

Methodological issues related to indicator definition were among the first issues that the Network agreed on. It was regarded as important to define the methodology so as to make the work as transparent as possible. A methodology for defining eHealth indicators had been published recently by one of the Network members (Ref. no. 13). It was presented and discussed, and accepted as a starting point for the work. The methodology combines expert-led top-down and community-led bottom-up processes to define indicators. The top-down procedure is predominant in indicator work that focuses on defining measures for monitoring the implementation of policies and their impact on a societal level (e.g. economic growth, the main aim also in European level eHealth indicator work). This approach is expert-led and predominantly science-based. It has been used in e.g. OECD and EU eHealth indicator work, but without transparency of stakeholders and their goals. The bottom-up methodology is used especially in the fields where the aim is to monitor or assess policy or strategy implementation and impacts on the micro level – e.g. on the local environment. Indicators are tailored to the needs and resources of the end users or stakeholders, but still remain rooted firmly in the fundamental principles of the policy in question. The top-down and bottom-up indicator frameworks share four common phases, which were taken as the basis of the Nordic eHealth Research Network work plan:

- Defining the context (human and environmental) for measurement with two primary components:
  - Identifying key stakeholders.
  - Defining the relevant area or system.
- Defining the goals. Top–down approaches rarely include this step formally, as the goals are pre-determined by funding agencies or Government offices.
- Defining methods for indicator selection and categorisation. Indicators are often chosen qualitatively, by reviewing expert knowledge, peer- reviewed literature or existing indicator work.
- Defining the data. This step tests the indicators by applying them. Data are collected, analysed, reported and feedback is acquired from different user groups. (Ref. no. 13).

The first two phases call for the operationalization of the policy and strategy goals, as well as description of the context. It was agreed that these steps are needed in order to define actor- and policy-relevant indicators, and in order to anchor the indicator work to the activities to be monitored. To do this, it was agreed to conduct and report on a content analysis of the most recent eHealth policy documents in the Nordic countries, reporting the key stakeholders and goals of the policies to be monitored. Finland and Sweden had translated their eHealth policies into English while the most recent eHealth policies from Norway, Denmark, and Iceland only existed in their native languages. It was decided that Norway would lead this work, but they would also collaborate with Denmark when doing the work.

The identification of the relevant systems and methods for indicator selection began with taking the existing OECD eHealth indicator definitions as well as the existing Nordic surveys as primary materials. Each of the OECD eHealth indicators was mapped against different Nordic survey variables to find communalities. One indicator was selected from each of the OECD indicator groups (EHR-, HIE- and PHR-indicators), for which data was defined, collected and reported. Next chapter contains the results of this validation work, while the concluding chapter will describe the lessons learned.

3. Results

3.1 Policy analysis

3.1.1 Methodological considerations

To be able to compare different Nordic policies, there is a need to understand/analyse what is behind them. Building upon analyses of the current situation, the policy documents reformulate and define new eHealth goals. To define joint variables for Nordic countries (apart from the OECD-dataset), a structured analysis of eHealth policies was needed. This fitted well with the proposed indicator methodology, which starts from defining the context and goals (Ref. no. 13). These first two phases call for operationalization of the policies' and strategies' goals as well as a description of the stakeholders.

3.1.2 Materials

English versions of the policy documents were obtained from the health authorities in Finland (Ref. no. 32) and Sweden (Ref. no. 33). The policy documents from Denmark (Ref. no. 47) and Norway (Ref. no. 34) only existed in their native languages. Iceland does not have a separate eHealth policy document that has been translated into English. Information on the Icelandic eHealth policy can be found in Annex 4. Most Nordic eHealth policy makers update their eHealth policies on a regular basis. Only a few of these are translated into English. The documents selected for content analysis thus only represented a subset of all eHealth strategy documents of the period between 2007 and 2010 (Figure 1).

Figure 1 Cover pages of the eHealth policy documents used in the analysis

3.1.3 Method used

The documents from Finland, Sweden, Norway and Denmark were analysed with use of text analysis tools by two different researchers in three steps. The first researcher annotated the texts by use of a text annotation programme (hyperRESEARCH) (http://www.researchware.com). Sentences and sections that contained statements about goals, stakeholders and measures were identified by reading, and were labelled with an appropriate code/tag. As the documents were annotated, the code book was enlarged. Documents that had been annotated before the code book was fully developed were read and coded a second time. Tagged statements were sorted and counted by use of the reporting functions in the hyperRESEARCH programme. Thereafter, the second researcher annotated the same texts with the use of the same code book. The second researcher used the nVivo text annotation tool (nVivo at www.qsrinternational.com). In a third step, the first researcher compared the coding practices of both, identified document sections that had only been coded by one of the researchers, decided on whether the document section deserved a particular code/tag and updated his own codes/tags.

3.1.4 Results

General aims/goals

As could be expected, the policy documents contained a large number of sentences and sections about general aims/goals. These could be sub-grouped into statements about a) healthcare services, b) health-IT services and c) the empowerment and activation of patients/citizens.

a. Statements about healthcare services: All policy documents contained statements about improving the quality of healthcare services. The Swedish document paid more emphasis to using ICT as a tool to instigate change in healthcare organizations. All policy documents contained goal statements about improving the effectiveness of the healthcare services but these were most prominent in the Danish document. Statements about improving the support for healthcare processes were most prominent in the Norwegian and Danish eHealth policies.
b. Statements about health-IT (eHealth) services: All four documents contained goal statements about improving access to relevant health information through IT-services and about improving information security and privacy. All policy documents also contained goal statements about making more data available for secondary use, but the Norwegian and Danish documents laid greater emphasis on this aspect. Only the policy documents from Sweden and Denmark put emphasis on improving the usability of the systems. Statements about improving the IT-architecture were most prominent in the Finnish policy document.
c. Goal statements about the empowerment and activation of patients/ citizens: All four policy documents contained such goal statements.

Measures/plans to achieve the particular purpose

Statements about measures and plans could be divided into a) plans for establishing IT architectures and IT-services, b) plans for standardisation activities, c) plans to enhance information security and privacy, d) plans to improve access to data for secondary use, e) plans for establishing law and regulatory frameworks, and f) others.

a. Plans for establishing IT architectures and IT-services: All policy documents described many measures to establish common IT-services. Measures to establish IT-services for clinicians were most common in policy documents from Norway and Sweden, whereas plans to establish patient portals and other IT-services for patients were most prominent in the Swedish and Finnish documents.

Measures to establish a common IT-architecture were most often mentioned in the Finnish document.

b. Plans for standardisation: Such plans were most prominent in the policy documents from Finland, Sweden and Norway.
c. Plans to enhance information security and privacy: Plans for implementing Information security regulations and tools were most prominent in the Finnish policy document.
d. Plans to improve access to data for secondary use: Such plans were most prominent in Sweden and Norway. There were no mentions of such measures in Denmark and only one in Finland.
e. Plans for establishing law and regulatory frameworks were present in all four documents.
f. Others: Only Sweden mentioned plans for supporting innovation. Only Finland mentioned plans for enhancing the quality of software used in the healthcare sector.

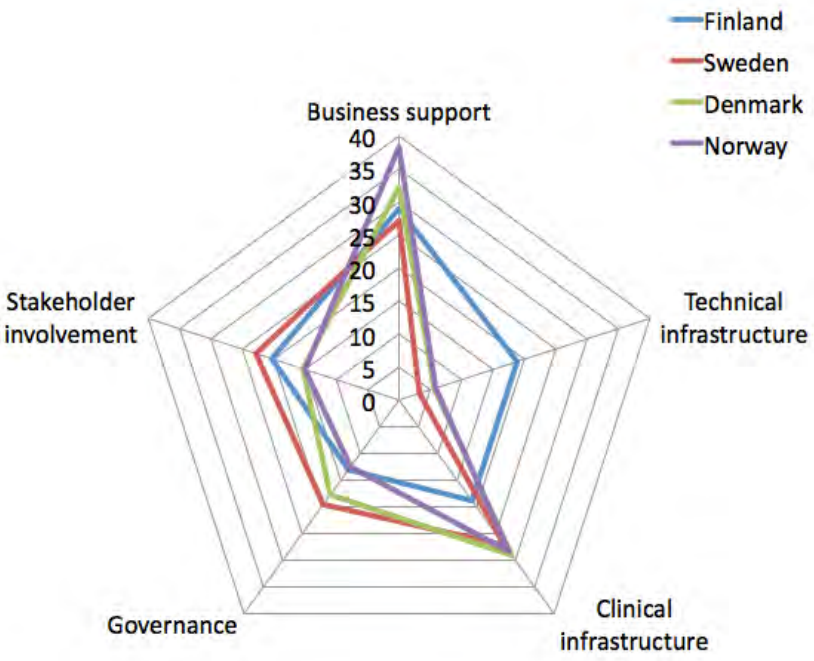
Stakeholders identified in policy documents

Statements about stakeholders were identified in all policy documents but the Swedish and Danish documents identified the largest number of different stakeholders. All policy documents explicitly identified the clinician and the patients as stakeholders. Healthcare leaders and health policy makers were identified as stakeholders in the policy documents from Sweden, Denmark and Norway. IT-service operators and vendors of eHealth systems were only mentioned as stakeholders in the Danish and Finnish policy documents. Private vendors of healthcare services were only mentioned in the documents from Sweden and Denmark.

Overall policy profiles

A spider diagram visualisation of the overall strategic profiles of the eHealth policy documents (Figure 2) was developed by a categorisation of statements into "business support," "technical infrastructure," "clinical infrastructure," "governance" and "stakeholder involvement." Goal statements that related to improving IT-services, healthcare quality, and support for healthcare processes were grouped into the "business support" construct. Statements that related to IT-architecture were grouped into "technical infrastructure." The item "stakeholder involvement" was constructed by adding up the total number of statements about stakeholders. Goal statements pertinent to improving effectiveness, improving leadership and management, making more data available for secondary use and improving information security and privacy were grouped into the "governance" construct. Finally, goal statements related to the support of clinical work, research and education were grouped into "clinical infrastructure."

Figure 2 – Strategic focus profiles in the eHealth policy documents



3.1.5 Implications for indicator development

Whom to survey

The analysis reveals that the policy documents address the needs of many different stakeholders. To be able to assess whether policy goals have been met, all stakeholders probably need to be surveyed. For instance, plans for establishing services to the patient now occupy a prominent position in many strategy documents. Patients should therefore be surveyed. One should also consider surveying those interested in the secondary use of healthcare data (e.g. researchers/quality controllers/leaders of healthcare organisations).

How to collect data

There is a clear tendency towards establishing centralised services (e.g. a prescriptions database). This enables the collection of data about users' behaviours by sampling log data from the service.

3.1.6 Conclusions

This analysis has shown that Nordic eHealth policy documents have more similarities than differences. Developing a common indicator set for monitoring the attainment of eHealth policy goals should therefore be feasible.

As also mentioned in the materials section, the analysis of the results has been based on written documents/policies, available on the internet, and given to the group from ministry representatives. It should be noted that the documents selected for content analysis only represent a subset of all eHealth strategy documents. As such, the collection is a snapshot from the time they were published (Figure 1). Each country's eHealth policy document reflects and builds upon achievements from the past, i.e. they have a history. The policies analysed have also been redefined during the period. The results cannot therefore express the level of evolution of the policies, the current importance of the goals, the level of advancement in each country or the effectiveness of the policies.

The focus points of the main goals in the policies have been adapted to specific issues of relevance for each country at the time of publication of the policy document. A generalisation of the results can therefore not be claimed today and will rather require further studies. The results obtained are, however, important to illustrate the usability of the method applied and to build a theory about the importance of the results and their connections with the indicators developed. Further replication of the results achieved can contribute to understanding the differences in policies goals and outcomes and also policy makers' preferences when developing strategies at a national level.

3.2 Testing of first common Nordic eHealth Indicators

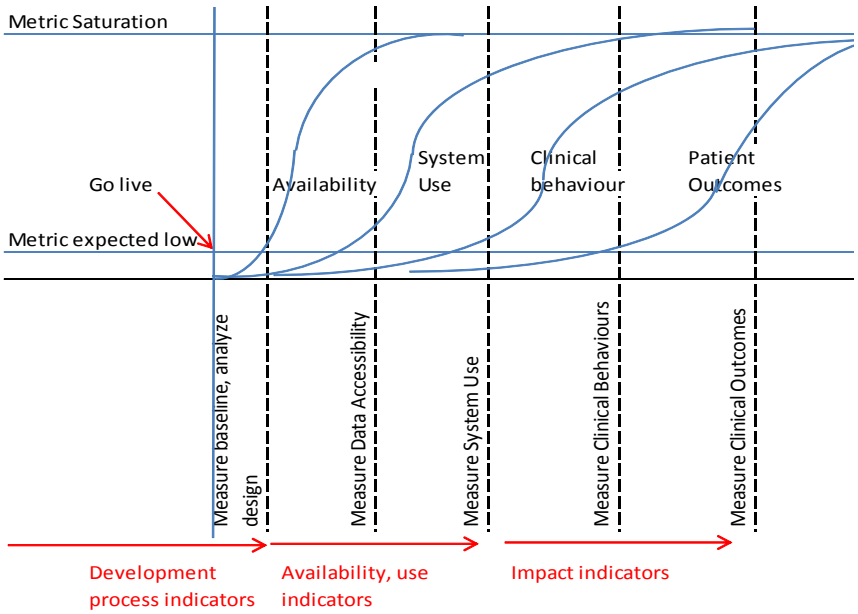
3.2.1 Data and Methods for indicator selection and grouping

Phase one of the indicator methodology calls for defining the systems in question, and phases three and four of the methodology call for the mapping and grouping of indicators. Since the Nordic work started with two indicators (availability and use) for the OECD defined key systems/services (key EHR, HIE, PHR and Telemedicine functionalities), there was not yet a need for a generic conceptual framework for grouping the indicators. The OECD grouping of the functionalities was accepted as presented. The availability and use indicators for OECD-defined functionalities were mapped against variables used in current Nordic

surveys to find communalities and differences, and to select the first common Nordic eHealth indicators. In order to do the comparison, a template was prepared listing the availability and use of the OECD-draft functionalities, to be filled in by the Network members responsible of the national surveys. The draft OECD indicator definitions were distributed to the Network participants to facilitate a search of similar variables in the national surveys.

Nordic surveys cover indicators beyond availability and use, including system and information quality and user satisfaction issues, and to some extent also experienced impacts. Finding communalities in these was left for the second year of the work, when the survey translations would be ready for a complete content analysis. It was accepted from the start that a common grouping for indicators would be needed in the second year of the work. The OECD focus on availability and use as the first indicators in the "chain" of indicators was regarded as a logical way to proceed, since it is difficult for users to rate the system or service, the information quality, or the user satisfaction unless they have experience of use. Also, changes in outcomes prior to the system or service being available and being used would not be possible. To discuss the idea of stepwise progress in defining different indicator categories in the Nordic eHealth research work, a Canadian example of the timing of indicator data collection was presented (Figure 3).

Figure 3 Timing of data collection for different types of indicators (Modified from a presentation of Francis Lau in a Medinfo 2010 workshop)



To get an overall picture of the work ahead and to anticipate an indicators past availability and use, one potential candidate for grouping the indicators (the IS success framework, (Ref. no. 35)) was presented and discussed in the first Network meeting. The framework has been used as a basis for grouping indicators in the National Evaluation Methodology in Finland (Ref. no. 9) (Ref. no. 29) as well as in Canada (Ref. no. 36). Canadians have updated the framework with contextual elements (Ref. no. 37). It has also been mapped against other commonly used frameworks (Ref. no. 12). A further update has been carried out to group elements for a literature review (Ref. no. 38), adding the updates of the Canadian framework and mapping the elements against a generic economic evaluation model.

3.2.2 Comparison of the data sources

The different Nordic eHealth survey questionnaires formed the primary data source for the indicator work. These have been described in the introductory chapter. Prior to comparing the actual measures of the surveys, the data sources needed to be compared. Following the OECD definitions (Ref. no. 39), each Network member provided the following details to a data collection template about their surveys:

- Sampling method: sample or comprehensive.
- Format of survey: electronic, paper or both.
- Frequency of data collection: one-time, yearly, 2–3-year interval, more seldom.
- Level of data collection: national, regional or local.
- Populations (Informants) surveyed: organizations – e.g. CIO's, practitioners, patients, citizens.
- Population size(s): (N).
- Response rate: % of population size.
- Representativeness of sample: comparison of respondent and population demographics.
- Institutional comprehensiveness: Facilities covered in surveys/data collection (1. primary and secondary care hospitals – departments, practitioners 2. ambulatory – practices, practitioners 3. residential care facilities 4. ancillary service providers (e.g. labs) 5. retailers of medication 6. preventive care providers 7. individual consumers, 8. Other.
- Demographic information was available in the surveys for cross tab analysis.

A comparison of the key findings is presented in Table 3. The data collection is sample-based in Norway and Denmark, the Swedish and Finnish availability surveys are comprehensive. All the surveys are national, the Finnish survey covers also Aaland, and the Danish survey covers also Greenland and the Faroe Islands. Sweden and Denmark collect some data annually, other surveys are conducted less frequently. Finland, Sweden and Norway survey the CIO's of the organisations, while all countries also survey clinicians. The clinician survey covers physicians in all countries, and also nurses and medical secretaries in other countries but Finland. Nobody surveys patients. The public sector and doctors' perspective are thus well represented in surveys. The Finland and Denmark surveys also cover private providers. Sweden and Norway has both electronic and paper surveys, Finland and Denmark are electronic only. The response rates vary from 15% to 100%.

Table 3 Summary of key elements of the current national eHealth surveys

	Denmark	Norway	Sweden (UserAward)	Sweden (Jervall et al)	Finland (Reponen et al)	Finland (Viitanen et al)
Population	Doctors, nurses, secretaries	Doctors, nurses, assistants	Doctors, nurses, assist n secretaties	IT-leaders in hospitals and municipalities, hospital managers	IT leaders in hospitals and municipalities, hospital managers	Doctors
Sample size	1558	239	1 368	21 county councils representing 250.000 employees	21 hospital districts, 295 municipalities, a sample of private providers	4000
Frequency	2001 – 2006 2010, 2011.	2008, 2010	2004, 2010	Yearly (since 2000)	2003, 2005, 2007, 2010...	2010...
Theoretical framework	health care usability heuristics	Consensus in work group	ISO 9241, cross industry usability heuristics	SKL official LBAS Account plan, 2005, which includes standards and official definitions	Consensus in work group	EUnetHTA; DeLone & McLean IS success model; ISO 9241
Method	Web based questionnaire	Web based questionnaire	Web/paper based questionnaire	Questionnaire	Web based questionnaire	Web based questionnaire
Recruitment	Professional associations	Investigator selected and contacted	Professional associations	National level Healthcare organizations/County Councils, private healthcare organizations	Investigator contacted health institution CIO's directly	Professional associations
Key Indicators	# passwords # login System use	Actual use, implementation	Work issues, training, comm. time saved, usability	Level of implementation and use of IT applications, legal issues in relationship to acceptance and use of applications Quality of service Usability inputs Access to information	Availability (level of implementation) and use of IT applications and quality control systems, IT costs, education	System and information quality (usability), support service quality, experienced benefits on processes and service quality

Some of the countries focus on indicators based on eHealth systems, some on key functionalities of these systems. Some of the surveys are based on a practical consensus method to define key indicators; others have used a more theoretically grounded approach for defining the key variables. The background (demographic) data collected are likewise very varied.

3.2.3 Selection of the first indicators to be tested

The OECD-defined key functionalities were listed in the internal background document for an OECD meeting held in Paris in January 2012. They were updated in the OECD task force virtual meetings during 2012 in preparation for the OECD task force leader meeting in Paris at the end of November 2012. Table 4 summarises the OECD functionalities from January 2012 (used as a starting point for the Nordic work), their OECD-updates from October 2012, and the Nordic research group specifications for the functionalities.

The January 2012 list of functionalities was used to generate a template that was completed by each of the Nordic Network members. The OECD-indicator working group had drafted definitions (indicator metadata) for each of these functionalities. The January 2012 versions of the draft definitions were given to the research group to generate a common understanding of measures to be selected from each country's surveys. The OECD draft definitions raised several questions, which were discussed in the Network meetings in February, April, May and August 2012. It was agreed that the Nordic countries should specify the common metadata for these functionalities, and communicate these specifications also to the OECD.

The following issues were raised regarding the concepts and terminology used in the OECD metadata in the Network meetings from January 2012:

- *Terminology.* There are unclear terms used for functionalities, actors and data in the OECD definitions that need harmonising and checking for consistency. E.g.: "Provision," "placing (of order)," "ordering," "patient is taking," "provider" (clinician – physician, nurse), "core patient data," "structured format."
- Many of the OECD definitions for EHR- and HIE-functionalities as defined in the January 2012 documents seemed to be in the wrong category, calling for better definition of key EHR-, HIE- and PHR-

functionalities. E.g. electronic booking of an appointment is in the EHR-category, while it should be in the PHR-category.

- *Indicator definitions* need clarification. Availability is not an identical concept to Access: Availability can be defined as a functionality offered by an organization, whereby the most reliable data sources are logs and management surveys. Access can be defined as a possibility of the authorised person to use the functionality: it may be available in the organization but inaccessible to part of the authorised personnel. Access can be measured most reliably using data from physician/nurse surveys or logs.
- The Network members would define all data entering (input) functionalities as EHR-functionalities. Data access or viewing (output) functionalities can be either HIE- or EHR-functionalities, depending on the defined levels of data comprehensiveness (the viewed data can come from institutional, regional or national repositories). The clinician viewing only data entered within the clinician's own organization forms a part of EHR-functionality, while viewing patient data entered elsewhere forms a part of HIE-functionality.
- Availability of data cannot be compared unless the quality of data is comparable. Data quality covers at least institutional and geographic comprehensiveness. The following levels were specified: available locally (within the user's own institution), regionally, nationally, or internationally. As regards the comprehensiveness of the viewed data, it is also important to know if the information viewed includes public sector hospital data, ambulatory care data and private sector data (in addition to accuracy of the actual contents that are made available, see also next point).
- For some of the data availability functionalities, there was a question also of specifying the content's completeness and accuracy: e.g. in the case of a complete medication list, is it ELECTRONICALLY PRESCRIBED medication, including also paper, fax and phone prescriptions, or DISPENSED medication, OTC medication or even medication cleared by the patient (taken).
- The integration level of the functionalities needs to be specified, since it can explain some of the results on consequent indicators of use and usability. The following dimensions were identified: the information/ functionality is available a) in a separate system (needs separate sign-on), b) by navigation or c) fully integrated into EHR.

Even if there were open questions regarding the OECD functionality definitions, each country completed the excel-based template with data avail-

able from surveys and logs, listing the open questions to be clarified. When the table was completed and the first workshop had been held, a selection process was started to review communalities between the measures. A method of elimination was used: One researcher first read all the data (questions) from national surveys that was added by the Network members to the template. In the first round, functionalities were dismissed where all countries did not have at least one question/measure. Also those functionalities were dismissed where all the Network members had informed that a saturation point had already been achieved (e.g. documenting detailed clinical care). Many of the OECD functionality definitions from January 2012 were not clear enough to be able to identify whether the indicator focussed on electronic DOCUMENTING (input; entering or generating of data) or VIEWING (output) of data, and so these functionalities were also dismissed (most of the functionalities for documenting or entering the data in electronic format were in any case saturated). After this, the remaining functionalities were taken one by one, with the aim of selecting one functionality from each of the lists of EHR-, HIE- and PHR-functionalities for these purpose of demonstrating the possibilities and challenges in developing joint indicators.

The elimination process resulted in one OECD-defined EHR-functionality – the availability of the medication list – to be selected as the test EHR-functionality, for which common measures would be specified and a comparison would be demonstrated. It was emphasised that in the format it was presented in January 2012, it is not necessarily an indicator for a key EHR-functionality, since availability (viewing) of a complete list of medications often requires a health information exchange to view medication prescribed to a certain patient in different organizations. The functionality could be defined to include only medications prescribed to a certain patient within a respondent's own organisation, but then it should not be referred to as complete.

For the OECD-defined HIE-functionalities, a similar method of elimination was used. The availability of electronic transmission of prescriptions was selected as potentially the most common indicator, where comparable data would be available and where the definition of the functionality was relatively clear. The process was repeated with the PHR-functionalities, selecting availability of electronic booking of an appointment as an example, even though it was not regarded as a straightforward PHR functionality, but rather an information exchange functionality (between the patient and the provider).

Table 4 Availability, use (and usability) of key OECD-defined EHR, HIE, PHR and Telemedicine functionalities, with the Nordic Research Network specifications

Indicator grouping	OECD January 2012 functionality description	OECD Task force updates October 2012	Nordic Research Network specifications
EHR availability	Entry of core patient data electronically in a structured format -e.g. medication list	[Specify, if] following types of clinical data are generated/available electronically for individual patients in your practice setting within your own organization/own practice. Yes/No -Medication list -Radiology test results (reports) -Radiology test results (images) -Problem list or Diagnoses -Reason for Encounter -Allergies -Immunisations -Vital signs -Patient demographics (e.g., age, gender) -Lab test results	Comments: Two different functionalities are measured in the same question: generating (input of) the data and viewing (output of) the data. Generating a Medication order (saturated) Question on Availability of Medication list is overlapping with a question of listing medications of an individual patient (see below)
EHR availability	Electronic recording and use of detailed clinical care	Detailed clinical Notes from encounter with clinician/medical history/anamnesis	
EHR availability (for CIO's)		Does your electronic system allow you to perform the following functions electronically -List patients who are due of overdue for tests -List medications of an individual patient prescribed from within your organization -List medications of an individual patient prescribed from outside your organization -Provide clinical summaries of patients -List patients by diagnosis -List of patients by lab result -List of all patients taking a particular medication	Suggested specifications (example): Does your electronic system allow you to perform the following functions electronically: -List medications of an individual patient? Yes/No What is the information quality? Accuracy (prescribed/dispensed/OTC/taken); Completeness (electronic/paper/phone/fax); Geographical comprehensiveness (organisational/regional/national/international); Institutional comprehensive-ness ((public/private//ambulatory/hospital)
EHR availability	Electronic provision of real-time information to clinician to optimise the quality of the order, request, or referral -e.g. medication dss	Does your electronic system include access to: -Clinical guidelines and best practices -Structured order sets (for hospitals) -Drug-drug interaction alerts -Drug-allergy alerts -Drug-lab interaction alerts -Contraindications as alerts (e.g., based on age, gender, pregnancy status)	Comment: Only routinely surveyed in Finland

Indicator grouping	OECD January 2012 functionality description	OECD Task force updates October 2012	Nordic Research Network specifications
EHR availability	Electronic tracking system ensuring right medication-right patient-right time	Do you have an electronic system that compares ordered medication to what is administered to patients at the point-of-care (e.g., bar coded, RFID) (for hospitals)? Yes/No/don't know	Comment: Only relevant for hospitals/ nursing homes. Not routinely surveyed in the Nordic countries
EHR availability	Secure asynchronous electronic communication between patients and providers		
EHR use		Frequency of use [of core patient data] All the time, most of the time, some of the time, rarely, never	Same definition
EHR usability (for clinicians)		How easily can you, as a clinician, do the following (3-point Likert scale + cannot generate) -List patients by diagnosis -List of patients by lab result -List of patients who are due of overdue for tests -List of all medications taken by an individual patient (including those prescribed by other doctors) -List of all patient taking particular medication -List of all lab results for an individual patient -Provide patients with clinical summaries	Comment: Usability variables were not included in the January 2012 OECD data, thus mapping of this indicator against the Nordic survey questions was not conducted in 2012, but will be done in 2013
HIE availability	Placing of orders/requests/referrals -e.g. medication ordering Electronic receipt of results	Does your electronic system allow you to: -Generate an Order for Medications/Prescriptions -Send the prescription electronically to the pharmacy -Generate an Order for Lab Tests -Send the order electronically to the laboratory testing facility -Generate Orders other tests (e.g. radiology)- optional	Suggested specifications (example) Does your electronic system allow you to Send a prescription electronically to the pharmacy? Yes/No What is the system quality? Degree of integration? (separate system/ integrated to EHR); availability to pharmacies? (specific pharmacy/regional pharmacies/nationally/ internationally); Codes used for medication?
HIE use		Frequency of use: routinely, not routinely, turned off, not possible, don't know	Same scale OR proportion of electronically transmitted prescriptions of all prescriptions made in the organisation
PHR availability	Electronic appointment scheduling (patient electronically requests an appointment)		Is it possible for clients to book appointments electronically with your organisation? YES/ NO Which options are there for booking? Choose-book (web access)/ accept-book (e.g. SMS access) For which services is the booking possible? (Laboratory, dental health, maternity care, imaging…) What is the scope of user access? (Local/ regional/ national portal)

Indicator grouping	OECD January 2012 functionality description	OECD Task force updates October 2012	Nordic Research Network specifications
	Patient medication renewal		
	Patient supplementation of data -e.g. medication list		
	Viewing of own clinical data -e.g. own medication list		
PHR use			
Telemedicine availability	% of Communities with Telemedicine Solutions		
Telemedicine use	Per Capita Count of Clinical Telemedicine Events		
	Per Capita Count of Patients Enrolled in Telehomecare (also called home monitoring)		
	Per Capita Count of Health Professionals Participating in Distance Education		
	Per Capita Count of Health Care Professionals That Use Telemedicine to Provide Care to Patients		
Telemedicine benefits	Avoided Patient Travel to Healthcare Appointments/Services		

3.2.4 Availability and use of a complete list of medications

The OECD definition of this functionality from January 2012 is depicted in Table 5. The original questions from the Nordic surveys and other available data sources are depicted in Table 6.

Table 5 OECD draft definition of "availability of a complete medication list" (39)

Name	Medication list (as an example of provision of core patient data)
Construct	Electronic list of medications that the patient is taking, as complete and up-to-date as possible that is available to every provider that sees the patient
Definition: Who	Every provider who sees the patient (physician, nurse)
Definition: What	Complete and up-to-date medication list
Definition: How	Available electronically across all settings (i.e. all medications a patient is taking or has been prescribed/dispensed)
Significance	Patient safety(reduces medication errors and adverse events) and efficiency
Other considerations	There are countries in which the provider can't see a full list because of patient privacy restrictions or patient preferences. Should the list include only prescribed medications or also herbals, supplements, etc.? Should the measure differentiate between medications from all settings (tied to medication reconciliation) and medications from within a single institution/ setting?

Table 6 Measures of availability of a medication list in the Nordic surveys

Country/ question ID	Survey question/ data source
Finland	public primary and specialised care organisations, private organisations, where ePrescription is available/ pharmacies which have joint ePrescription/ nr of ePrescriptions made/ nr of dispenses made/ proportion of ePrescriptions of prescriptions made: www.kanta.fi
2.2	Have you already joined the national ePrescription system? (20)
2.3	Which code server codes are available in your EHR-system: 4) Medication (Fimea ATC-classification) (20)
19.3	Patient's current medication list is presented in clear format (1=fully agree, 5=fully disagree) (21)
18.5.	Information on medication prescribed in other organisations is easily available (1=fully agree, 5=fully disagree) (21) The patient's current medications are listed in a clear format. (1=fully agree, 5=fully disagree, functionality does not exist) (21)
Sweden:	Is the county ready in deploying IT-support for prescription and co-ordination of prescriptions? (22) Does the county use the same medication list for all health care? (22)
Norway	[Hospital IT-department]: "When do you plan to implement a) an electronic chart, b) a prescription system, c) a system for medication management" (24) www.helsedir.no
Denmark	How often do you use the "specific system" – (Note: 15 different systems are listed for answering: Very often, Often, Sometimes, Seldom, Very seldom, Not relevant) (25) www.medcom.dk

"Availability of an electronic list of medications that the patient is taking" was thus the first OECD indicator to be tested within the joint Nordic data. The questions that were raised to specify the indicator before comparable data could be presented were collated to form the following specifications, which complements the initial OECD metadata definition:

Construct:
Availability of an up-to-date electronic list of current medications (not medication history) that the patient is taking that is available to every provider that sees the patient. The construct is specified by three sub-constructs, defining the data quality (increasing accuracy, completeness and comprehensiveness) of the current list.

- The identified levels of content accuracy: the list includes medication:
  - Prescribed.
  - Dispensed.
  - OTC.
  - Cleared to be taken by the patient.
- The identified levels of content completeness: the list includes medication:
  - Prescribed electronically,
  - Prescribed on paper,
  - Prescribed over the phone,
  - Faxed.
- The identified levels of geographical comprehensiveness: the list includes medication prescribed/dispensed/obtained:
  - Within respondents organization,
  - Regionally,
  - Nationally,
  - Internationally.
- The identified levels of institutional comprehensiveness: the list includes medication prescribed in:
  - Public institutions,
  - Private organizations,
  - Ambulatory setting,
  - Hospital setting.

Who
Every provider that has the right to access the list (physician, nurse).

What
Complete and up-to-date medication list.

How
Available electronically across all settings.

Other aspects of the medication list that were identified as impacting the comparison of use and usability were related to system quality:

- Integration level: the list is available
  - Integrated in the prescriber's electronic medical record,
  - Via a link,
  - In a separate system (requiring separate log-in).
- Security level: the list is available for authorised persons with:
  - Pre-access control,
  - Post-access control,
  - No control.

Some countries also had questions surveying the use of systems that encompass these functionalities, either directed to the administration or to the clinicians. The measures used were:

- Finland – Administration survey: Use of specific system: Estimated intensity of production use (10%, 25%, 50%, 90%, 90+ %).
- Sweden – Administration survey. Scale: upphandlat, pilot, <=50%, >50%, 100%.
- Norway – Administration survey. Scale: 5-point Likert scale
- Denmark – Clinicians' survey. Scale: How often do you use a specific system? Very often, Often, Sometimes, Seldom, Very seldom, Not relevant.

Due to scale differences, it was not possible to compare usage levels of selected functionalities at this stage. A comparison of variables was, however, possible: A 5-point scale was generally used in the surveys. Naming of the scale values differed, however. The use-question was presented in administration surveys more often than in clinicians' surveys. It can be argued that clinicians' estimate of use is more accurate than the administration's estimate.

On the basis of the analysis made on the availability and use variables, and in keeping with the OECD draft survey template development, the construct could be formulated into the following common survey questions:

Availability of medication list (O= question directed to administration or CIOs of organisations/ C= question directed to clinicians)
O/ C: Does your electronic system allow clinicians to perform the following functions electronically:

- List medications of an individual patent? YES/ NO. If yes,
    - O: At which level does your organization have this functionality available? The list contains all medication prescribed to the patient (geographical comprehensiveness).
        - Within the organization.
        - Regionally from all.
            - Public ambulatory institutions.
            - Public hospitals.
            - Private ambulatory institutions.
            - Private hospitals.
        - Nationally from all.
            - Public ambulatory institutions.
            - Public hospitals.
            - Private ambulatory institutions.
            - Private hospitals.
        - Internationally.
    - O: How complete is the list? The list contains medication prescribed in following formats.
        - Electronically.
        - In all formats (including paper, fax and phone prescriptions).
    - O: How accurate is the list? The list contains.
            - Prescribed medications.
            - Dispensed medications.
            - OTC-medications.
            - Medication cleared to be taken by the patient.
    - O: Is the functionality integrated in the EHR-system in your organization (yes/no).

Use
C: To what extent do you use the medication list in the clinical care of your patients? OECD-SCALE: All the time, most of the time, some of the time, rarely, never (Ref. no. 40).

Demonstrating comparable data for availability of the selected functionalities required finding answers to the above questions, defining the data sources, and converting the data to a comparable format in each of the different Nordic countries. Table 7 describes replies from different

countries to the draft Nordic survey questions, which serves as a basis for selecting comparable data for the demonstration.

Table 7 Comparability of data for of availability of the medication list

	Finland	Sweden	Norway	Denmark
Data accuracy, content completeness	ePrescribed + dispensed	ePrescribed + dispensed	ePrescribed + dispensed	ePrescribed + prescribed per paper and phone + dispensed
Data comprehensiveness: Institutional	public ambulatory	public ambulatory	public ambulatory	public ambulatory and hospital
Data comprehensiveness: Geographical	national	regional/national	national	national
Integration level	integrated	all units	Primary care physicians: Integrated in the EHR-system. Else: available in a web-browser	link-based
Data security: access control	Yes (secure authentication and jurisdiction)	yes (secure authentication and jurisdiction)	Yes	not known

Variation can be seen in the accuracy and content completeness of the medication list, in the level of integration, as well as the institutional comprehensiveness of availability. Clinicians cannot yet view all prescriptions made in different formats for a specific patient in Sweden, Finland and Norway. This service will be implemented in the "Kjernejournal" project (Norway) and via the KanTa –implementation in Finland. In Denmark, the list is most accurate, containing ePrescriptions, paper, and phone prescriptions and information on dispensing. In Denmark, the medication list is currently available via the public health portal, and full integration of EHR systems is estimated to be completed in 2013. In Finland, the functionality is integrated into the EHR-systems with secure authentication and jurisdiction. Data from Iceland is depicted in Annex 4.

Metrics for the variables measuring medication list availability:

- Alternative 1: Statistics (Finland, Norway for 2012 data, Denmark) = a/b:
  a. Nr. of care provider organizations having joined ePrescription system via which a list of medications prescribed electronically to patients is available to clinicians.

b. Nr. of public care provider organizations.

- Alternative 2: Surveys (Norway for 2008 data, Sweden):
  c. Proportion of public care provider organizations offering complete list of medications prescribed to patients.

Table 8 depicts the data sources used in different countries to obtain the metrics for the "availability of the medication list"-indicator.

Table 8 Definition of data sources for the "medication list" availability metrics

	Finland	Sweden	Norway	Denmark
Sources	a) www.kanta.fi b)www.thl.fi/fi/tilastot/hoitoonpaasy/pth	Apotekens Service AB	www.helsedir.no (log data)	www.medcom.dk
Grouping	a) Public primary, secondary care providers/ date when joined b) Public primary, second-ary care providers		No grouping	
Time coverage	a) since 2010 b) since 2008	since 2008	Since 2011	
Update Frequency	a) every two weeks b) twice per year	yearly	On demand	every two days

With these specifications and data sources, statistics (Table 9) could be compiled to demonstrate the Nordic data on the availability of a national level list of medications. Table 9 needs to be understood in conjunction with Table 7, which depicts variation in the completeness and accuracy levels of the medication lists in the different Nordic countries.

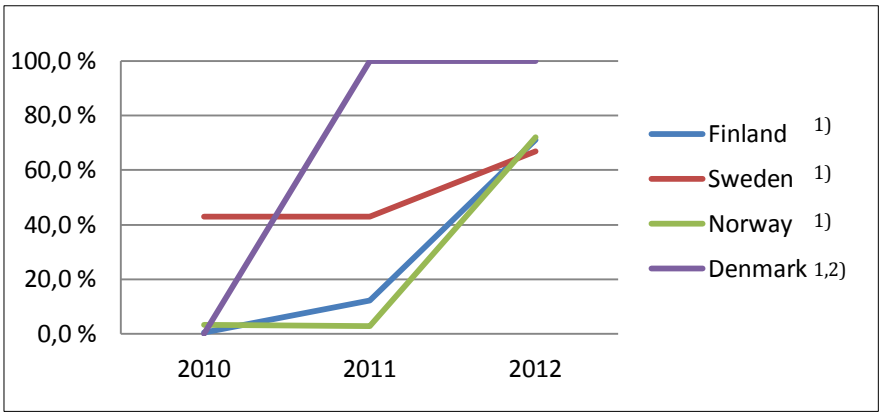
Table 9 Statistics: Availability of a national level list of medications prescribed electronically to patients in public organisations in outpatient settings (as of late 2012)[1]

	Finland	Sweden	Norway	Denmark
2010	0.5%	43%	3%	0%
2011	12.2%	43%	3%	100%
2012 (December)	71.1%	67%	72%	100%

[1]Needs to be interpreted in conjunction with data from Table 7.

The statistics could be presented in graphical format, as depicted in Figure 4. It has to be noted that the data presented in Figure 4 is still not completely comparable. The figure needs to be interpreted together with data from Table 7, added as footnotes in Figure 4.

Figure 4 Demonstration of Nordic availability of a complete list of medications that the patient is taking (as of late 2012).



1)List integrated, includes electronic prescriptions from public ambulatory settings.
2)List not integrated, includes electronic, paper and phone prescriptions from public ambulatory and hospital settings.

Proportion of public ambulatory care organisations offering clinicians access to a nation-wide , up-to-date list of medications prescribed electronically to patient.

3.2.5 Availability and use of Electronic transmission of prescriptions

Availability of Electronic transmission of prescriptions is the second of the OECD HIE-functionalities, which it was agreed to demonstrate during the test phase in the Nordic Indicator Network. The Network took as a basis a draft definition (from January 2012) of this functionality as described by the OECD. This is depicted in Table 10.

Table 10 OECD draft definition of the indicator "availability of electronic transmission of prescriptions" (Ref. no. 39)

Name	Electronic transmission of prescription
Construct	Medication order is transmitted electronically to dispensing pharmacy
Definition: Who	Dispenser
Definition: What	receives prescription
definition: How	Electronically and automatically
significance	patient safety (reduces medication errors and adverse events) and efficiency (reduces transaction costs)
Other considerations	Re-keying of prescription fields and faxing should be excluded, but otherwise the construct is independent of the electronic transmission approach (e.g. could be point-to-point, through a server/aggregator) Consider the generic version of this measure (i.e. electronic transmission of orders, requests, and referrals)

Table 11 presents the first round of comparison of survey questions and other data related to this indicator.

Table 11 First identification of Measures of availability of electronic transmission of prescriptions in different surveys

Country/ question ID	Survey question/ data source
Finland 2.2	Have you already joint the national ePrescription system? (20)
	Public primary and specialised care organisations, private organisations, where ePrescription is available/ pharmacies which have joint ePrescription/ nr. of ePrescriptions made/ nr. of dispensing made/ proportion of ePrescriptions of prescriptions made: http://www.kanta.fi/61
Sweden	Data exists from logs (Apoteket Ab)
Norway	[GPs' offices] In which ways do you send following info: prescriptions (electronic/paper). The eResept services will provide a log that, as of today, provide info on GPs sending of ePre-scriptions (24)
Denmark	Between institutions on-line statistics available from Medcom.dk Within hospitals: How often do you use the medication administration system? (25)

There were questions in surveys in Finland, Norway and Denmark that measured the availability of ePrescription, but logs were given as the main sources for this data. Also for this indicator, several issues needed to be specified before the data would be comparable. The specifications were also seen to be important in order for the indicator to be used as a dependent variable when explaining use and patient satisfaction. First, the specification needed to distinguish hospital and ambulatory care settings. Second, the specification was related to the prescription type – do we limit the term "prescription" to electronically made prescriptions (not paper, fax or phone prescriptions converted to electronic format). The third issue was related to the integration level of the functionality, and the fourth issue to the geographical availability of the electronically transmitted prescriptions (i.e. whether the prescriber needs to know the dispenser prior to transmitting the prescription or not, which is anticipated to impact on the level of use of this functionality). Thus, the specifications made for the OECD draft construct were as follows:

Construct

Availability of transmission of an electronically made medication order (prescription) in electronic format from prescriber to dispensing pharmacy.

Who
Prescriber: public ambulatory/ inpatient organisations, dispenser, defining the level of geographical availability.

- A predetermined dispenser (point-to-point, main option for inpatient settings).
- All dispensers regionally.
- All dispensers nationally.
- Dispensers across national boarders.

What
Dispenser receives the prescription.

How
Electronically and automatically.

Also for this variable, there were data from some countries that defined the use of this functionality from the logs. For calculating the proportion of use (% of prescriptions made transferred in electronic format), information on the total number of prescriptions made within the country was also needed. This information was obtained from different statistics in different countries:

- Finland – ePrescription log (www.kanta.fi)/Apteekkariliitto: nr. of ePrescriptions made in the national database per year/nr. of prescriptions dispensed by pharmacies per year.
- Sweden –Apotekens Service AB log.
- Norway – eRecept services log: nr. of ePrescriptions mediated via the service/ total nr. of prescriptions handled by pharmacies.
- Denmark – Medcom.dk.

The question to be formed based on this metadata was defined following the OECD questionnaire as follows. The surveys were not seen as the most accurate sources of national level comparison data. Instead, the preferred source of data to answer this question was seen to be log/statistical data:

Availability and use of electronic transmission of prescriptions
Is it possible for prescribers in your organization to transmit electronically made prescriptions in electronic format to a pharmacy/ pharmacies? YES/ NO. If yes,

- At which level does your organization have this functionality available?
  - Point-to-point (main option for prescriptions ordered within hospitals from hospital pharmacies),
  - Via a server regionally,
  - Via a national server,
  - Internationally,
- Is the functionality integrated into the EHR-system in your organization (yes/no)?
- What is the proportion of electronically transmitted prescriptions of all prescriptions made in your organization?

Table 12 depicts a comparison of the indicator data from different Nordic countries.

Table 12 Comparability of data for "availability of the electronic transmission of prescriptions." Situation in Iceland is depicted in Annex 4.

	Finland	Sweden	Norway	Denmark
Level of transmission (ambulatory care)	Via national server	Via national server	Via national server	Via national server
Integration level	Integrated	Integrated	Primary care: Integrated. Specialty care: Integrated in one hospital (which is a pilot for the service)	The shared medication record is integrated in most hospital systems, GP and practising specialist systems.

The indicator data for "availability of medication list" and indicator data for "availability of electronic transmission of prescriptions" is the same, since the organisations where the above-mentioned medication list is available also have the functionality of transmitting prescriptions electronically. The data sources for the use (proportion) of electronically transmitted prescriptions are depicted in Table 13, and the statistics in Table 14.

Table 13 Data sources for "use of electronically transmitted prescriptions"

	Finland	Sweden	Norway	Denmark
Sources (a: nr of ePrescriptions, b: nr of prescriptions)	a)http://www.kanta.fi/61 b)http://www.apteekkariliitto.fi/media/pdf/vuosikatsaus_2011.pdf	a)www.apotekesser-vice.se	a) www.helsedir.no b) Statistics taken from the prescriptions registry (www.reseptregisteret.no) or from the pharmacy systems (FarmaPRO)	a)www.medcom.dk
Grouping	a) Public primary, secondary care providers/ date when joined b) Public primary, secondary care providers		n.a.	
Time coverage	a) since 2010 b) not known		Since 2011	Since 1992
Update Freq.	a) twice per month b) yearly		Monthly (?). On demand?	Monthly

Table 14 Statistics on "use of electronically transmitted prescriptions."

	Finland	Sweden	Norway	Denmark
2012	8.5%[2]	85%	16%[3]	85% [1]

[1] average for the entire country – regions vary between 71% and 95%.

[2] average for the entire country (calculated from all dispensing made annually, which is ca 25% too large number. With 25% smaller denominator figure would be 11%). Usage within organisations that have joined ePrescription 63%, variation between 41-90% between regions (end of December 2012). Monthly updates in the statistics available in http://kanta.fi/documents/12105/3448005/Varjon+tiedote+joulukuu+2012/5557dd66-e811-4d5d-9655-930924a6a3d3

[3] Average for the entire country. Usage within organisations that have joined ePrescription is probably around 100%.

It has to be noted that in Finland, data about the total number of prescriptions made annually do not exist, and the figure used depicts the number of dispensed medications (which is up to 25% too large figure, since one prescription can be dispensed in several parts). Data for the use of this functionality – proportion of prescriptions transmitted electronically from organisations to pharmacies – are calculated as the number of electronically transmitted prescriptions annually per the number of prescriptions made annually. This data can be accessed most reliably from log and statistical data.

A comparison of data in Table 9 (with proportion of organisations having joined ePrescription, via which a medication list can be accessed) and Table 14 reveals an interesting finding: By the end of 2012 over 70% of public prescribing organisations had joined ePrescription in Finland compared to approximately 62% in Norway. Implementation of

the ePrescription has been at a hectic pace in both countries. In Table 14, the proportion of electronically transmitted prescriptions remains still remarkably lower in Finland (even with corrected denominator) compared to Norway. There can be several possible explanations for this seemingly contradictory finding: The most obvious one is that the usage rate is much higher in Norway than in Finland (up to 100% estimated usage in prescribing organisations that have joined the ePrescription system). Part of the difference may be due to diffusion of the ePrescription system having perhaps started from big cities in Norway, whereas the big cities in Finland have joined the system towards the end of the year. The statistical data available may have been calculated slightly differently. There can also be differences in the health care structure: private care providers have not yet joined the ePrescribing system in Finland or Norway, and in Finland e.g. most occupational health is provided by private organisations.

3.2.6 Availability and use of Secure messaging between carer and patient: electronic booking

From the selection of PHR functionalities defined in the January 2012 document by the OECD, the availability of patient appointment scheduling in electronic format was selected as an indicator to be tested. Table 15 depicts the OECD metadata for the variable.

Table 15 OECD definition for secure messaging between carer and patient (39)

Name	Patient appointment scheduling
Construct	Patient electronically requests an appointment
Definition: Who	Patient
Definition: What	Requesting a medical appointment
Definition: How	Electronically
Significance	Improves accessibility, reduces administrative costs
Other considerations	To collect this data, one approach is to ask provider if the functionality is available and to what extent it is used Construct is technology neutral (e.g. can be through email, patient portal)

Measures that were available in the Nordic surveys are depicted in Table 16.

Table 16 Measures of availability of electronic booking of an appointment in different surveys

Country/question ID	Survey questions
Finland: 5.4.a-d)	In which services do you have direct e-booking (patient selects an available time via internet)/ booking and confirmation via email/ text-message booking and confirmation/ offering time via text message? What type of electronic booking is there available: 1) Direct booking for patient with computer 2) booking via email 3) booking via SMS, 4) offering of time via SMS. (In addition an open question for each: for which services available?"
Sweden	"Share of booking systems connected to MVK (national service, My Healthcare Contacts)"
Norway	[GP's offices]: "Does the office offer electronic services to the patients?," "Is this module integrated with the EHR system?" "Which electronic services have been established? a) Booking of appointments, b) Renewal of prescriptions, c) Simple documents (declarations), (Asynchronous) Dialog with the patient"
Denmark	Functionalities (booking a time to see GP) available on the national public health portal. Data for use available in log files, but never analysed.

The functionality was further specified by the Nordic Network as a patient-initiated act of requesting an appointment electronically by choosing an available time (published by the provider), which is registered/confirmed by the provider. In order to provide comparable data, we need to specify care levels, where these services are available, as well as list actual services where booking is available. To generate a dependent variable for levels, we also needed to know, whether or not the booking system was integrated into the provider systems. The network-defined indicator metadata is depicted below:

Construct

Availability of electronic request (booking) of an appointment for patients by choosing an available time (published by the provider), which is registered and confirmed by the provider.

Who

Service provider: electronically publishes available times for booking and registers/confirms bookings made by patient.

- Primary care centres.
- Specialised care (hospitals).
- Private health care organizations.

Patient chooses an available time electronically, gets electronic confirmation of booked appointment.

What
Requesting appointment for (e.g.)

- Laboratory.
- Dental health.
- Maternity care .
- Imaging.
- Student health care.
- Health centres, polyclinics (medical appointment).
- District nurse/ diabetes nurse/ community nurse.
- Age-related health checks/screening.
- Mammography screening.

How
Electronically.

For this variable, use was not generally monitored, except in Finland, where use was monitored as the estimated intensity of production use (10%, 25%, 50%, 90%, 90+%). The Danish Portal would be another source for log data, but it has not been analysed. A common Nordic question for surveys to be formed based on this metadata was defined as follows.

Availability of electronic request to book an appointment
Is it possible for clients to book appointments electronically from your organization by choosing an available time published by you in electronic format? YES/ NO. If yes,

- For which services is it possible to book appointments electronically?
  - Laboratory.
  - Dental health.
  - Maternity care.
  - Imaging.
  - Student health care.
  - Health centres, polyclinics (medical appointment).
  - District nurse/ diabetes nurse/ community nurse.
  - Age-related health checks/screening.
  - Mammography screening.
- Is the functionality integrated into the information systems in your organization (yes/no).

Use of electronic booking of appointments

What is the proportion of electronically made bookings in your organization per service?

Table 17 depicts sources, grouping and timing of the data for availability of electronic booking of an appointment in the different Nordic countries.

Table 17 Definition of data sources for the "availability of electronic booking of an appointment" metrics

	Finland	Sweden	Norway	Denmark
Sources	Winblad, Reponen et al.2011		EPJ-monitor National surveys	Logs
Grouping	Health centres (primary care), hospitals (specialised care), private	see Table 18	Primary care physician Others?	
Time coverage	2005			
Update Freq.	2005, 2007, 2010		2008, 2010	

The log data was not analysed in Denmark and in Sweden, the measures were still under construction, and only Finland had data on availability for specified services. The results are depicted in Table 18. The results for availability of electronic booking for different services in Finland are depicted in table 19. The results are grouped by type of organisation (public primary, public secondary, private) that is offering the service.

Table 18 Comparability of data on availability of electronic booking of an appointment. Situation from Iceland is depicted in Annex 4.

	Finland	Sweden	Norway	Denmark
Levels of care where available (public primary, specialised, private)	Public primary, specialised, private		Primary care physicians. Other service providers (e.g. Dental care, imaging services, others?)	Most GPs have electro-nic bookings available to registered citizens. No exact measure has been obtained
Services where available/ primary	Laboratory Dental health Maternity care Imaging Student health care Health centres, polyclinics (medical appointment) District nurse/ Diabetes nurse/ community nurse Age-related health checks/screening Mammography screening	Not measured in Sweden currently, the measures are under construction. The national goal is that 40% of all bookings will be made electronically by 2016	Appointments	
Services where availab-le/specialized	Laboratory			
Services where available/ private	Imaging Doctor's appointment			
Integration level	?		Primary care: Integrated	

Table 19 Proportion of organisations offering electronic booking to specified services

	Finland	Sweden	Norway	Denmark
Primary care	15%			
Laboratory	6.4%			
Dental health	4.3%			
Maternity care	4.3%			
Imaging	1.4%			
Student health care	5%			
Health centres, polyclinics (medical appointment)	0.7%			
District nurse/ Diabetes nurse/ community nurse	4.3%			
Age-related health checks/screening	0.7%			
Mammography screening	0.7%			
Secondary care	62%			
Laboratory	61.9%			
Private care	40%			
Med. appointment	36.6%			
Imaging	3.3%			

Information on the proportion of bookings made electronically with the necessary specifications (Table 20) was only available from Finland.

Table 20 Proportion of bookings made electronically (to available services). Situation in Iceland is depicted in Annex 4.

	Finland	Sweden	Norway	Denmark
Health Centres	18.1%	Statistics not	n/a	
Specialised care (hospitals)	22.9%	available	n/a	
Private	23.8%		n/a	

4. Concluding remarks and recommendations

eHealth benchmarking seems to be high on the agenda not only in the Nordic Countries but worldwide. The Nordic Council of Ministers' eHealth group made an important decision at the beginning of 2012 to support the establishment of a network of research organisations within the Nordic countries, Greenland, the Faroe Islands and Aaland that can develop, test and assess a common set of indicators for monitoring eHealth in these countries for use by national and international policy makers and scientific communities to support the development of Nordic welfare.

Close collaboration between the Nordic eHealth Research Network and the Nordic Council's eHealth group has given the Research Network a mandate and resources to meet it. Perhaps even more importantly, a vital link between the eHealth policy makers and researchers in the field has been established in the Nordic countries, with several joint meetings held during 2012. This has for the first time made it possible to jointly work towards measurable policy goals and the provision of commonly defined measurement data that can be exploited in and between Nordic Countries to steer decision-making related to goals and their implementation – Evidence-based management (EBMgt or EBM).

Close collaboration with the OECD has been essential to the Network to base the indicator selection work on the experiences of the OECD work, while exchanging experiences has given the work a deeper meaning and purpose beyond the Nordic benchmarking. By linking the results to the OECD eHealth indicator work, the Nordic eHealth Research Network has participated in formulating the OECD eHealth indicators.

Via close co-operation with the Nordic eHealth group and the integration of organizations responsible for the national eHealth surveys, the Network has participated in developing compatibility between the Nordic surveys.

4.1 Summary of the results

The Nordic eHealth Network has implemented a defined and published methodology to develop, group and collect data about indicators. This report describes four key outcomes of the Research Network. 1) the strategic building and establishment of the Nordic eHealth Research Network, 2) validation of the 4-phase indicator methodology, 3) preliminary policy analysis results, and 4) indicator analysis results from the first common Nordic eHealth indicators and suggested updates for the OECD indicator definition.

The strategic building and establishment of the Nordic eHealth Research Network illustrates a method to establish and work in close collaboration with researchers defining the indicators and collecting indicator data, as well as policy makers who are responsible for defining the national eHealth activities and need information on attainment of the goals set for these activities.

The 4-phase indicator methodology was defined and published so as to provide a transparent basis for the indicator work. The empirical work for validating the methodology included definition of goals and stakeholders with policy analysis, and definition of systems and selection and testing of indicators with indicator analysis. Taking OECD-defined key functionalities for EHR, HIE and PHR as a starting point, the analysis of the national eHealth surveys in the different Nordic countries showed that there are some common availability measures for these functionalities.

The analysis of the national policy documents revealed a high degree of similarity between the Nordic countries. All national eHealth policies contained statements about improving quality, effectiveness and patient empowerment in healthcare services, as well as improving information security, access to relevant health information, privacy, and secondary use. Effectiveness statements were most prominent in the Danish document. The Swedish document laid more emphasis on using ICT as a tool to instigate change in healthcare organizations. Improving support for healthcare processes was most prominent in the Norwegian and Danish eHealth policies. Sweden and Denmark laid emphasis on improving the usability of the systems and Finland on improving the IT-architecture. All policy documents described several measures to establish common IT-services, for clinicians most prominently in Norway and Sweden, and for patients most prominently in the Swedish and Finnish documents. Plans for standardisation were most prominent in Finland, Sweden and Norway. Plans to enhance information security and privacy were most

prominent in the Finnish policy document. Plans to improve access to data for secondary use were mainly mentioned in Sweden and Norway.

As Iceland did not join the Network until August 2012 a separate Annex (Annex 4) was written for Iceland. Similarly to the other Nordic countries, the eHealth policy for Iceland included statements about quality improvements, increased effectiveness and patient empowerment. The strategy included plans to establish seamless and secure access to relevant health information across healthcare institutions and geographical boundaries. Moreover, the Icelandic document included statements about standards, information security and privacy, with the emphasis on improving access to relevant health statistics to support decision-making at all levels of healthcare: the clinical, administrative and policy level

The indicator analysis was based on the Nordic survey questions, which were mapped against a list of OECD-compatible EHR, HIE and PHR indicators. The report demonstrates that collection of pilot data from existing sources is feasible, but comparability of the data is a real challenge, which needs to be tackled. Modifications to the questions are also needed in order to generate comparable results. The process of trying to "retrofit" existing indicator data from the Nordic countries into the framework developed by OECD also revealed a need for further specification of the OECD questionnaire items/ variables, and the need for metadata required to provide unambiguous, comparable results. Ambiguous concepts were defined, e.g. "availability," "access," 'data provision'. Specifications for the metadata included institutional and geographic levels of comprehensiveness of the data or functionality, completeness and accuracy of the data provided by the functionality, and also the level of integration of the functionality and the security and structuring of the data.

The "scope" of an information system service, i.e. whether the service can be accessed from any part of the healthcare system or whether the access is delimited by geographic or institutional borders is an important property of the service. A service that breaks geographic or institutional barriers must be considered more mature than a service that does not see the healthcare sector as a whole. As information systems and services hopefully become more mature, one will see a stronger need for collecting indicator data on the effect of eHealth services on outcomes of healthcare services.

4.2 Limitations of the work

The work has been conducted with transparent methodologies for both policy analysis and indicator analysis. Both of these analyses were validated with two individual researchers annotating the results. The corresponding national ministries as well as the organisations responsible for eHealth surveys in the Nordic countries have reviewed and commented the draft documents. However, there are some limitations to the results, which need to be taken into consideration.

Firstly, the policy documents analysed were dated between 2007 and 2010. Newer documents included a lot of recent changes, which had not yet happened by the time the old documents were published. Therefore, the differences in the Nordic policies may not be as big as presented in this document. Also, the policy documents were slightly different in nature, and did not necessarily contain all the current policy statements that form the countries eHealth policies. A future challenge is to define data sources for updating the policy analysis section in a manner that helps define key goals for national as well as the joint Nordic indicator selection.

A second limitation relates to the survey questionnaire analysis: at the time of the data collection, the survey questionnaires were in different Nordic languages. Network participants translated those questions that they considered as measuring the OECD-defined functionalities. Nordic surveys have mainly been constructed to measure systems, not their functionalities. In addition, there were several issues that needed to be specified, as can be seen from the specifications made in this document. Even if the data provided for the analysis was in a common language, there were differences in the understanding of different functionalities and a lot of "silent knowledge" behind each of the national survey questions that needed to be made transparent. The key concepts for each of the functionalities and the "silent knowledge" were extracted in meetings prior to being able to compare the questions. This work has only just begun with the test set of selected questions. The questionnaires will all be translated into English for the formal content analysis with a qualitative analysis program. Final validation of the comparability of the variables can be made only after successfully conducting the data collection for all the selected joint indicators. A challenge remains with updates to the surveys, so as to keep up with new and modified questions.

A third limitation is related to collaboration with the OECD. There has not been an "official" mandate or agreed modes for collaboration with the OECD. The practicalities have dictated that participation in the EHR-task force has been most active. The work in the OECD task force has

focused on defining survey questions, following the initial metadata definition. The OECD model questionnaire development has proceeded past and beyond the initial OECD metadata definitions from January 2012, which was taken as a starting point for the Nordic Research Network. The Nordic Network has defined the metadata in parallel with defining the first common Nordic survey questions. Common agreement of the metadata with the OECD task forces would have made commenting of the OECD model survey question updates easier.

4.3 Learning outcomes – recommendations

In spite of the limitations, several methodical and methodological conclusions can be drawn from the work already done.

The strategic establishment and collaboration between researchers and policy makers proved fruitful for both parties – for researchers it helped in grounding the indicator work to the practices for which the indicators were being developed. For policy makers it gave insight into indicator work and provided the means for monitoring policy implementation for structured identification of short- and long-term policy modification needs. It is important to improve the connections between the Nordic work and the OECD HIE and PHR task forces. To maintain the links, it is also important that permanent mechanisms for the definition, production and distribution of compatible national monitoring data will be clearly defined. To include international variables in national monitoring is a cost-effective way to provide valuable data internationally as well as for Nordic benchmarking. In regard to national data collection, it is essential not to become dependent on surveys that are conducted with different content, definitions, ambitions, goals and clients, which makes them useless for monitoring developments over time nationally.

The Indicator Methodology Validation proved extremely fruitful, providing several learning outcomes – recommendations. Generic conclusions are that the methodology steps should be included in all indicator work. Policy makers should consider parallel developing of policy goals and identification of the appropriate indicator. Ideally, indicator data should be collected to establish a benchmark before implementing the policy. Policy makers should also consider encouraging vendors to implement features that enable automatic collection of indicator data from their application/system/service. Specific conclusions related to different phases of the methodology are as follows:

1. Phase 1 – Defining the context (key stakeholders and the area or system):
    - Key scientific outcome: defining the systems in sufficient detail is a prerequisite to providing internationally comparable data. Defining the stakeholders (done in the policy analysis) was essential to define, whose viewpoint needs to be reflected in the indicator work. Existing indicator work does not go into adequate detail in defining either of these contextual elements.
    - Key practical outcomes: necessary specifications for the three OECD-defined functionalities functionalities to provide comparable results of their availability and use in the Nordic countries.
2. Phase 2 – Defining the goals for the activities to be measured:
    - Key scientific outcome: Method for and demonstration of analysis of existing goals of eHealth policies, to ground the indicator work in the activities defined in the eHealth policies. Existing indicator work does not define the goals (or variation in national eHealth policy goals) in sufficient detail to define key measures for monitoring them.
    - Key practical outcome: Method for and preliminary results of the analysis of Nordic eHealth policies and their goals/emphasis.
3. Phase 3 – Defining methods for indicator selection and categorization:
    - Key scientific outcome: there are various conceptual frameworks for grouping of eHealth indicators, but no conceptual analysis conducted in order to map them to compare indicators provided within different conceptual models.
    - Key practical output: a robust practical grouping is presented for future work.

4. Phase 4 – Defining the data, reporting and feedback collection:
    - Key scientific outcome: for validity, data comparability is essential, and it can only be achieved if systems/ services are defined in a detailed manner to make comparison possible. For data reliability, each indicator needs to be accompanied with a source. Log data and to an exceeding degree up-to-date register data can provide a reliable alternative in many countries to survey data. For functionalities, where log information is available, it provides a more reliable source than surveys (on availability, use). For indicators, which rely on user experience (e.g. use, usability), users themselves rather than an indirect source is preferable.

- Key practical output: specifications for the first three OECD EHR-, HIE- and PHR-functionalities to form the first common Nordic indicators, with preferred data sources. Identified need for agreements for use of log and register data for monitoring eHealth.

4.4 Future work needed

A recent literature review was conducted on studies that focus on eHealth benefits (not including pure usability studies or evaluation of eHealth services from a socio-technical perspective) (Ref. no. 41). The review shows that studies are in general concerned with usefulness and user-related issues, such as user acceptance and satisfaction and attitudes towards new systems. Some studies were found that aimed to evaluate IT effects on the quality of work performance. Financial studies are mostly descriptive and indicate the difficulty in measuring qualitative effects of changes in monetary terms. Studies providing concrete evidence of the benefits of IT-based innovations are still few and of varying quality. This finding indicates the importance of starting with availability and use as the first indicators to demonstrate comparable monitoring of eHealth systems/services. This is feasible, since without availability there is no use, and without use, there is no experience on usability, changes to practices or impacts. The finding also indicates that there is a need for the comprehensive measurement of various effects.

The previous studies reviewed (Ref. no. 41) show that there is a gap between expected and factual outcomes. The total benefits are rarely identified in the short term, and can lead to unexpected costs and organizational changes. They are usually carried out before an IT-innovation has been introduced and thus cannot confirm that any anticipated effects have been realized. The review concludes that coherence between the context and goals is important to capture effects and outcomes that make sense in the context. In order to capture the values of IT-innovations it is necessary to capture the context in which IT is implemented (Ref. no. 41). This finding shows the importance of contextual or background variables—including information on the IT functionalities, users and environment of use—in the national surveys for eHealth monitoring. This finding also shows the importance of baseline data collection and a follow-up in order to measure the long-term effects.

Availability and use are also the indicators that are under focus for the OECD at present. The Nordic eHealth indicator work has proven that even

for these two indicators, a lot of background information needs to be collected in order to generate comparable information. Still, these indicators give a small indication of the actual success of the eHealth systems, and need to be complemented with usability and impact variables.

The work needs to continue with the definition of key benchmarking indicators beyond availability and use, based on the information needs of eHealth management as well as of clinicians and patients, aiming at improving citizen's health and welfare. Key stakeholders need to be involved in rating the importance of the detected indicators to test the whole methodological cycle.

A sound framework for the grouping of indicators is needed, that is robust enough to encompass variables from different frameworks. The Evaluation Group of the European Federation of Medical Informatics (EFMI) has provided a grouping of variables in eHealth studies that could be used as a basis (Ref. no. 42). The grouping has four categories: Structural quality, Information quality, Process quality and Outcome quality. This model needs to be mapped against the main other groupings used, e.g. indicators in the IS success model (see Annex 6), which have been defined in a long line of scientific publications, starting from DeLone and McLean's classic work from 1992. The Canadian (Ref. no. 37) and the Finnish (Ref. no. 29) (Ref. no. 38) national eHealth frameworks have added contextual elements. The Canadians found a total of 100 factors that influenced EMR adoption and its effect from 43 different studies, which they grouped under different framework categories. Standards, legislation, policy, governance and funding were added to the framework as factors directly influencing the adoption of eHealth solutions. Care quality and productivity-categories were among the ones with the strongest evidence on positive impacts. (Ref. no. 37). The Finnish survey for doctors is the first of the Nordic national surveys that has defined the conceptual framework used to generate survey questions beyond availability and use. The survey implemented the DeLone & McLean IS success framework as a basis for the survey. The questions for each of the framework categories are depicted in Annex 6.

Using the agreed grouping of indicators, the Nordic survey questions need to be analysed and reflected against the outcomes of work done in other countries on defining and testing variables and tools for measuring the success of information systems. This analysis will be conducted in the next two-year period as part of the activities of the Nordic eHealth Research Network. The policy analysis conducted during the first year needs to be updated, integrating the current policy goals with measures from the surveys and other data collection. A long list of measures per

indicator group needs to be created, including indicators beyond the availability and use. The long list needs to be subjected to different stakeholders to select and prioritize key measures and to generate a Nordic consensus on the minimum joint measures per indicator. The feasibility of the prioritized common Nordic measures and the availability of data in different Nordic countries needs to be assessed, and data collected and reported.

The plan for the indicator selection is following a method developed by the Rand Corporation, described in a recent paper (Ref. no. 43). This procedure combines scientific evidence and expert opinion using a consensus technique. In this procedure, preliminary indicators are extracted from the literature (starting from existing surveys) and anonymously rated by the individual experts of an expert panel (can also be done virtually). In a next round the panel meets to discuss, re-rate and gain consensus. Phase four includes defining the possible sources of indicator-related data by reviewing (and improving if possible) existing data from statistics, surveys etc. Thus, the work plan for the next period entails the following tasks:

- Reviewing the eHealth literature -> listing potential policy and scientific indicators, starting with content analysis of existing survey variables and policy indicators. Timeline: by end of 2013.
- Generating a format for the comparison of indicators. A first idea of the grouping of the variables to be listed on the format (cf. figure 3) was drawn from the literature. The grouping includes:
    - Background/context variables,
    - Variables measuring IT impacts on health service outcomes,
        - Population health impacts.
        - Cost-effectiveness.
    - Variables measuring IT impacts on health services,
        - Impacts on health care inputs or structures (incl. availability, usability of the IT system/functionality, IT system and information quality),
        - Impacts on health service process (including use) and
        - Impacts on health service outputs – productivity, cost-efficiency.
- Updating of the Policy data and Comparison of current Policy objectives/ targets vs. existing (collected) variables vs. OECD-target indicators by filling in the format using the policy analysis and survey data. Outcome – a feasibly grouped list of potential indicators, data sources and availability as well as frequency of data collection.

- Rating of the long list of measures by national experts in a panel, generating consensus for common Nordic eHealth Success Indicators. Outcome: Prioritized list of indicators per group. Timeline: by beginning of 2014.
    - Review and rating of indicators per group by experts (e.g. NCM eHealth group, national Medical Agencies and selected other stakeholders, i.e. users of indicator data) for outlining preferences for joint Nordic eHealth indicators.
    - Collating and reporting the results.
- Clarification of availability and quality of data for selected joint variables (from national surveys, statistics, log files etc.). Timeline: first half of 2014. This will be done after rating and agreement of joint indicators.
- Testing the available data, reporting and feedback from user groups by end of 2014.
    - collection of existing data from joint variables for demo of the entire list of Nordic eHealth indicators,
    - reporting and feedback.
- Inclusion of additional joint variables to national surveys, formatting existing variables.
- Report of the results and needs for developing data collection.

Steps 1–3 will be conducted mainly during 2013. Steps 4–6 will be conducted in parallel during 2014, integrating outcomes from steps 1–3 in different countries to their own data collection, following national survey timelines in the different countries.

4.5 Exploitation of the results

The OECD Indicator work will be followed closely in order to be able to integrate the OECD data needs into the Nordic eHealth indicator work. The specifications made by the Nordic eHealth research group as well as the usability and benefit indicators will be exploited in the national surveys:

In Sweden, the first IT policy for healthcare was published in March 2006. Annual updates have been made since and in 2010 the strategic focus shifted from organization-centricity and implementation to patient-centricity and use, resulting into an eHealth policy for health and social care. The Swedish county councils have developed a shared and funded action plan through the Center for eHealth in Sweden (CeHis) and use the

company Inera AB (owned by the county councils) to further improve their coordination and focus. To follow the implementation and use of IT within the county councils, the SLIT group (IT Strategists/IT Managers/CIO´s in the County Councils) has through CeHis collected data from all county councils using the same structured questionnaire since the year 2000. The latest of these national surveys was published in October 2012 (Ref. no. 44). In this project, CeHis collaborated closely with researchers from the evaluation working group of the Swedish Federation of Medical Informatics (SFMI), which is a mirror group to the European and International working groups in EFMI and IMIA. Exploitation activities are thus twofold. First, we aim to include the results of the Nordic Indicator work into the CeHis/SLIT questionnaires where applicable and second, we aim to disseminate the results of the Nordic Indicator work through SFMI to our European and International research network within EFMI and IMIA.

The Norwegian monitoring projects "EPJ-monitor 2008" and "EPJ-monitor 2010" were funded by the Norwegian Directorate of health and conducted by the Norwegian centre for research on electronic patient records (NSEP) at NTNU. Both projects were organized with a project leader and an advisory group. The Norwegian Directorate of Health is currently considering initiating a project on national eHealth indicators in 2013. The work done in NeRN will provide pivotal input for the strategic planning for the development, production and publication of national eHealth indicators.

Denmark has issued national strategies for health IT in 1995, 1996, 1999, 2003 and 2008. A new strategy is currently in preparation. National surveys of health-related IT-dissemination in the then 14 counties have been performed from 2001 to 2007 and again in 2010 to 2012. These last surveys have focused on clinician's use of and their attitude towards the health-related IT systems. Future surveys will be elaborated to include more of the indicators developed in the NeRN, and a closer cooperation with the office of the National Health-IT (NSI) has been established to ensure that the future national health IT strategies are built on an evidence-based status of dissemination and use. Furthermore the need for an annual monitoring of achievements has been acknowledged.

In Finland, the first national policy for applying information technology to health care and social welfare by the Ministry of Social Affairs and Health was followed by the information technology development programme, several governmental agendas, and finally legislation during the 2000's. A comprehensive survey on the implementation and use of eHealth was funded by the Ministry and conducted by THL and the University of Oulu (Fintelemedicum) for the first time in 2003, followed by a

series of surveys to monitor national development programmes and the implementation of regulations. The latest survey was conducted in 2010, in parallel with the first survey of user experiences regarding usability and benefits. (Ref. no. 45). With the operational responsibility for eHealth and eWelfare development in Finland being given to the National Institute of Health and Welfare (THL) at the beginning of 2011 (Ref. no. 46), planning, guidance, steering and follow up of the Finnish eHealth development became a mandatory task for THL. The Institute serves decision-makers in central and local government, actors in the sector, NGOs, the research community and ordinary citizens. A kick-off meeting for updating the two surveys was held on 29.11.2012, and planning for data collection for both surveys in the beginning of 2014. By that time it is anticipated that steps 1–4 have been conducted and a list of commonly agreed Nordic variables can be integrated into the surveys.

5. References

1. eHealthERA project. eHealth priorities and strategies in European countries. eHealth ERA report – towards the establishment of a European eHealth research area. Luxembourg: Office for Official Publications of the European Communities; 2006.
2. Gustafson DH, Wyatt JC. Evaluation of eHealth systems and services. BMJ. 2004;328 (7449):1150.
3. Eysenbach G. What is eHealth? JMed Internet Res. 2001;3(2):e20.
4. Pagliari C, Sloan D, Gregor P, Sullivan F, Detmer D, Khahan JP, et al. What is eHealth: A scoping exercise to map the field. JMed Internet Res. 2005;7(1):e9.
5 .eHealth – making healthcare better for European citizens: An action plan for a European eHealth area. COM (2004) 356. COM (2004) 356 communication from the commission to the council, the European parliament, the European economic and social committee and the committee of the regions. Brussels: Commission of the European Communities; 2004.
6. eHealth for health care delivery draft strategy. Geneva, 2004. Geneva: World Health Organisation, Department of Essential Health Technologies.; 2004.
7. eHealth action plan 2012-2020 public consultation. Europe's information society thematic portal. [Internet]. European Commission; 2011; cited 2012/11/05]. Available from: http://ec.europa.eu/information_society/activities/health/ehealth_ap_consultation/index_en.htm.
8. STM. Sosiaali- ja terveydenhuollon tietotekniikan hyödyntämisstrategia. Helsinki: Sosiaali- ja terveysministeriö; 1996. Report No.: 1995:27. In Finnish
9. Hyppönen H, Doupi P, Hämäläinen P, Komulainen J, Nykänen P, Suomi R. Towards a national health information system evaluation". Stud Health Technol Inform ;160. 2010 August 2010;160:1216-20.
10. Health and social sectors with and 'e'. A study of the Nordic countries. Denmark: Nordic Council of Ministers; 2005.
11. Stroetmann K, Artmann J, Stroetmann V, Protti D, Dumortier J, Giest S, et al. European countries on their journey towards national eHealth infrastructures (final European progress report) . European Commission; 2011.
12. Hyppönen H, Ammenwerth E, Faxwaag A, Nohr C, Walldius Å. eHealth indicators: Results of an expert workshop. Stud Health Technol Inform. 2012;180:328-32.
13. Hyppönen H, Ammenwerth E, de Keizer N. Exploring a methodology for eHealth indicator development. Stud Health Technol Inform. 2012;180:338-42.
14. Reponen J. Welcoming greetings from the Nordic Telemedicine Association. In: Doupi P, editor. Proceedings of the 6th Nordic Conference on eHealth & Telemedicine NCeHT2006 31 August – 1 September 2006, Finlandia Hall, Helsinki, Finland. Helsinki, Finland: Valopaino; 2006. p. 11-12.
15. Mahncke H, Brunk T, Jensen O, Birch S, Kullander M, Wahman M, et al. Nordic collaboration in health services. A feasibility study on the potentials and barriers towards an open market for health services in the Nordic countries. Copenhagen: Nordic Innovation Centre; 2009.

16. Roberts A, Reponen J, Pesola U, Larsen F, Mäkiniemi M, Heaney D, et al. Transnational comparison: A retrospective study on eHealth in sparsely populated areas of the northern periphery. TELEMEDICINE and e-HEALTH. 2010;VOL. 16(NO. 10).
17. Dobrev A, Haesner M, Hüsing T, Korte W, Meyer I. Benchmarking ICT use among general practitioners in Europe. Bonn: European Commission, Information Society and Media Directrorate General; 2008.
18. WHO. Global eHealth survey 2005. Geneva: WHO; 2005.
19. Kay M, Santos J. Report on the world health organization global observatory for eHealth strategic planning workshop, April 2008. Methods Inf Med. 2008; 47(4):381-7.
20. Reponen J, Winblad I, Hämäläinen P. Current status of national eHealth and telemedicine development in Finland. Stud Health Technol Inform. 2008;134:199–208.
21. Viitanen J, Hyppönen H, Lääveri T, Vänskä J, Reponen J, Winblad I. National questionnaire study on clinical ICT systems proofs: Physicians suffer from poor usability, vol. 80, is. 10, 708–725. International Journal of Medical Informatics. 2011; vol 80(10):708–725.
22. Jervall L, Pehrsson T. eHälsa i landstingen – inventering på uppdrag av SLIT-gruppen. CEHIS; 2011.
23. Vård IT-rapporten 2010. enkätundersökningar, flödesstudier och uppföljning av vård-IT-kartan 2004. UsersAward; 2010.
24. Heimly V, Grimsmo A, Henningsen T, Faxvaag A. Diffusion and use of electronic health record systems in Norway. Stud Health Technol Inform. 2010;160(Pt 1):381–5.
25. Christiansen, M.B., Nøhr, C. Undersøgelse af klinisk anvendelse af sundheds-it-systemer 2011. Available from: Virtuelt Center for Sundhedsinformatik, Aalborg University; 2011.
26. Nøhr C, Andersen SK, Bernstein K, Bruun-Rasmussen M, Vingtoft S. Diffusion of electronic health records: Six years of empirical data. In: Kuhn KA, Warren JR, Leong T, editors. Medinfo 2007. Proceedings of the 12th World Congress on Health (Medical) Informatics: Building Sustainable Health Systems. Amsterdam: IOS press; 2007. p. 963-967.
27. Christiansen MB, Nøhr C. Undersøgelse af klinisk anvendelse af sundheds-it-systemer 2012. Virtuelt Center for Sundhedsinformatik; Forthcoming.
28. 'Vård-IT-kartan'. UsersAward; 2004.
29. Hyppönen H, Viitanen J, Reponen J, Doupi P, Jormanainen V, et.al. Large-scale eHealth systems: Providing information to support evidence-based management. In: eTELEMED 2011: The Third International Conference on eHealth, Telemedicine, and Social Medicine. ; 2011. p. 89-96.
30. Viitanen J, Nieminen M, Hyppönen H, Lääveri T. Finnish physicians' experiences with computer-supported patient information exchange and communication in clinical work. Int J Electronic Healthcare. 2011;Vol. 6(Nos. 2/3/4):153-173.
31. Hardardóttir, G.A. Translation and National Clinical Validation of the Nursing Management Minimum Data Set (NMMDS) in Hospitals in the Country of Iceland [unpublished doctoral dissertation]. I: The University of Iowa; Iowa, U.S.A.; 2011.
32. eHealth roadmap – Finland. Coordination Group for international cooperation on eHealth, Ministry of Social Affairs and Health; Helsinki, Finland, 2007.
33. National eHealth – the strategy for accessible and secure information in health and social care. Ministry of Health and Social Affairs, Sweden; 2010.

34. Samspill 2.0 – nasjonal strategi for elektronisk samhandling i helse- og omsorgssektoren 2008 – 2013. Helsedirektoratet, Helse- og omsorgsdepartementet; Oslo, Norway 2010.
35. DeLone WH M, ER. The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems. Spring 2003;Vol 19(No 4):pp 9-30.
36. Evaluating telehealth "solutions": A review and synthesis of the telehealth evaluation literature. Health Canada. Office of Health and the Information Highway; 2000.
37. Lau F, Price M, Boyd J, Partridge C, Bell H, Raworth R. Impact of electronic medical record on physician practice in office settings: A systematic review. BMC Medical Informatics and Decision Making. 2012;12(10).
38. Hyppönen H, Vuokko R, Doupi P, Mäkelä-Bengs P, Lindqvist M, Saranto K. Impacts of structuring the patient record: A systematic review protocol and results of previous reviews. 2013 (Submitted to International Journal of Medical Informatics on January 31st 2013).
39. OECD. International Workshop: Benchmarking Adoption and Use of Information and Communication Technologies in the Health Sector. Background document. OECD, Directorate for Employment, Labour and Social Affairs, Directorate for Science, Technology and Industry. COM/DELSA/DSTI(2012)1, 17-Jan-2012.
40. OECD. Draft questions on provider-centric electronic health records for OECD survey for benchmarking health information technology. Personal communication. 2012.
41. Vimarlund V, Koch S. Identifying where the values come from IT-innovations in health and social care . Intelligent Information Management. 2012;4:296-308.
42. Ammenwerth E & de Keizer N. An inventory of evaluation studies of information technology in health care. trends in evaluation research 1982-2002. Methods Inf Med. 2005(1).
43. Van Engen-Verheul M, Kemps H, Kraaijenhagen R, De Keizer N, Peek N. Modified rand method to derive quality indicators: A case study in cardiac rehabilitation. . Stud Health Technol Inform. 2011;169:88-92.
44. Jerlvall L, Pehrsson T. eHealth in Swedish county councils. CeHis; 2012.
45. Hämäläinen P, Reponen J, Winblad I, Kärki M, Laaksonen M, Hyppönen H, et al. eHealth and eWelfare of Finland. check point 2011. manuscript. Helsinki: National Institute for Health and Welfare; 2013 (forthcoming).
46. Laki Sosiaali- Ja Terveydenhuollon Asiakastietojen Sähköisestä Käsittelystä, 159, 2007. In Finnish
47. National strategi for digitalisering af sundhedsvaesenet 2008 2012 – til fremme af befolkningens sundhed samt forebyggelse og behandling2007. Sammenhængende Digital Sundhed i Danmark.

6. Glossary of terms

6.1 eHealth

Arising from the revolution of the Internet, the term eHealth came into use in the year 2000. eHealth has made its way from the business world into academia and is now an accepted track and/or theme for many scientific conferences. There are, however, many different definitions of eHealth, ranging from "use of the internet or other electronic media to disseminate health-related information or services" (Ref. no. 2) to Eysenbach's definition of "an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking to improve health care locally, regionally, and worldwide by using information and communication technology" (Ref. no. 3).

A mapping of the field (Ref. no. 4) showed that most definitions encompass a broad range of medical informatics applications either specified (e.g. decision support, consumer health information) or presented in more general terms (e.g. to manage, arrange or deliver health care). However, the majority of definitions emphasizes the communicative functions of eHealth and specifies the use of networked digital technologies, primarily the Internet, thus differentiating eHealth from the field of health and medical informatics. The European Commission and the World Health Organisation give a simple but very broad definition of eHealth as "eHealth is the use of information and communication technologies (ICT) for health" (Ref. no. 5, 6).

6.2 Electronic health record (EHR) – for integrated care (ICEHR)

A repository of information regarding the health status of a subject of care in computer processable form, stored and transmitted securely, and accessible by multiple authorised users. It has a standardised or commonly

agreed logical information model which is independent of EHR systems. Its primary purpose is the support of continuing, efficient and quality integrated health care and it contains information which is retrospective, concurrent, and prospective (ISO/TR 20514:2005(E) © ISO 2005).

6.3 Electronic medical record (EMR)

The EMR could be considered as a special case of the EHR, restricted in scope to the medical domain or at least very much medically focused. It is a widely used term in North America and a number of other countries including Japan. The Japanese Association of Healthcare Information Systems (JAHIS) has defined a five-level hierarchy of the EMR (see JAHIS:1996):

a. Departmental EMR – contains a patient's medical information entered by a single hospital department (e.g. pathology, radiology, pharmacy),
b. Inter-departmental EMR – contains a patient's medical information from two or more hospital departments,
c. Hospital EMR – contains all or most of a patient's clinical information from a particular hospital,
d. Inter-hospital EMR – contains a patient's medical information from two or more hospitals, and
e. Electronic healthcare record – longitudinal collection of personal health information from all sources. (ISO/TR 20514:2005(E) © ISO 2005).

6.4 Electronic patient record (EPR)

England's National Health Service (NHS) defines the EPR as an electronic record of periodic health care of a single individual, provided mainly by one institution (NHS:1998). The NHS notes that the EPR typically relates to the health care provided by acute care hospitals or specialist units. This definition of the EPR has gained quite widespread currency outside of the UK but its usage is still often inconsistent in many places. (ISO/TR 20514:2005(E) © ISO 2005).

6.5 Computerised patient record (CPR)

Also referred to as a computer-based patient record, the term computerised patient record is used mainly in the USA and seems to have a wide range of meanings which may encompass the EMR or EPR. (ISO/TR 20514:2005(E) © ISO 2005).

6.6 Electronic health care record (EHCR)

The EHCR is a term which was commonly used in Europe, including the CEN 13606 standard, Health informatics – Electronic healthcare record communication (see ENV 13606-1:2000). It may be regarded as synonymous with the EHR and EHR is now rapidly replacing the term EHCR in Europe. (ISO/TR 20514:2005(E) © ISO 2005).

6.7 Personal health record (PHR)

The key features of the PHR are that it is under the control of the subject of care and that the information it contains is at least partly entered by the subject (consumer, patient).

There is a widespread misapprehension in the community, including among health professionals, that the PHR must be a completely different entity from the EHR if it is to meet the requirements of patients / consumers to create, enter, maintain, and retrieve data in a form meaningful to them and to control their own health record. This is not correct. There is no reason why the PHR cannot have exactly the same record architecture (i.e. standard information model) as the health provider EHR and still meet all of the patient/consumer requirements listed above. In fact there is every reason to ensure that a standardised architecture is used for all forms of EHRs (but certainly the ICEHR), to enable sharing of information between them as and when appropriate, under the control of the patient/consumer.

The PHR can then be considered in at least four different forms:

a. A self-contained EHR, maintained and controlled by the patient/ consumer.
b. The same as a. but maintained by a third party such as a web service provider.

c. A component of an ICEHR maintained by a health provider (e.g. a GP) and controlled at least partially (i.e. the PHR component as a minimum) by the patient/consumer.
d. The same as c) but maintained and controlled completely by the patient/consumer. (ISO/TR 20514:2005(E) © ISO 2005).

6.8 Personal Health Systems (PHS)

Personal health systems assist in the provision of continuous, quality controlled, and personalised health services, including diagnosis, treatment, rehabilitation, disease prevention and lifestyle management, to empowered individuals regardless of location. PHS consist of: intelligent ambient and/or body devices (wearable, portable or implantable); intelligent processing of the acquired information; and active feedback from health professionals or directly from the devices to the individuals. [http://ec.europa.eu/information_society/activities/health/glossary_of_terms/index_en.htm]

6.9 Telemedicine

Is the provision of healthcare services through use of ICT, in situations where a health professional and a patient (or two professionals) are not in the same location. It involves secure transmission of medical data and information, through text, sound, images or other forms needed for the prevention, diagnosis, treatment and follow-up of patients. Telemedicine services can encompass tele-radiology, tele-pathology, tele-dermatology, tele-consultation, tele-monitoring, tele-surgery and tele-ophthalmology as well as online information centres for patients, remote consultation/e-visits or videoconferences between health professionals. [http://ec.europa.eu/information_society/activities/health/glossary_of_terms/index_en.htm]

6.10 Medication List

A compilation of current medications. This may also include the history of medications for a period of time. A medication list includes medication start and stop dates, and may include the clinical indication. (Source: HISPC Cross Collaborative Glossary, U.S., November 2008).

7. Tiivistelmä

Tämän raportin tarkoituksena on esitellä pohjoismaista tutkimusyhteistyötä eHealth-indikaattoreiden kehittämiseksi, indikaattorimenetelmää ja analyysin ensimmäisiä tuloksia. Raportti on tulosta pohjoismaisen eHealth-tutkijaverkoston ensimmäisen vuoden työstä. Tutkija-verkosto perustettiin 15.2.2012 Pohjoismaiden ministerineuvoston eHealth-ryhmän alaiseksi työryhmäksi. eHealth-ryhmä antoi tutkijaverkostolle mandaatin eHealth-ryhmän olemassaolon ajaksi toukokuun 2013 alkuun asti.

Työ on perustunut indikaattorimetodologiaan, jossa on neljä vaihetta: 1) kontekstin määrittely (avaintoimijat ja relevantti toiminta-alue tai järjestelmä), 2) tavoitteen määrittely, jossa yhdistetään ylhäältä-alas ja alhaalta-ylös -toimintamallit, 3) indikaattorien valinta- ja ryhmittelymenetelmien määrittely ja 4) kerättävän tiedon, raportoitavien tulosten ja palautteen määrittely.

Metodologian noudattaminen osoittautui tärkeäksi. Konteksti ja tavoitteet määriteltiin analysoimalla eHealth-strategioita neljässä Pohjoismaassa käyttäen sisällön analyysiä, jolla etsittiin kolmenlaista sisältöä dokumenteista: tavoitteet, toimijat ja toimenpiteet. Tavoitteita ei ole yleensä määritelty ja analysoitu asiantuntijavetoisessa eHealth-indikaattorityössä. Pohjoismainen tutkijaryhmä huomasi, että strategia-analyysi oli tarpeellinen, jotta voidaan tunnistaa ne yhteiset tavoitteet, joiden saavuttamisen seuraamiseksi yhteisiä indikaattoreita tarvitaan. Analyysi paljasti, että kaikki strategiadokumentit sisälsivät lausumia laadun, tehokkuuden ja potilaiden valtaistamisen paran-tamisesta, pääsyn parantamisesta relevanttiin tietoon, tietoturvasta, yksityisyyden suojasta ja tiedon toissijaisesta käytöstä. Lausumat tehokkuudesta olivat vallitsevimpia Tanskan dokumentissa. Ruotsin dokumentti pani enemmän painoa ICT:n käytölle työkaluna terveydenhuollon organisaatioiden muutoksen käynnistämisessä. Terveydenhuollon prosessien tuen parantaminen oli vallitsevinta Norjan ja Tanskan eHealth-strategioissa. Ruotsi ja Tanska panivat painoa järjestelmien käytettävyyden parantamiselle, Suomi IT-arkkitehtuurin parantamiselle. Kaikki strategiadokumentit kuvasivat useita menetelmiä IT-palvelujen toteuttamiseksi, Norja ja Ruotsi eniten lääkäreille, potilaille eniten Ruotsin ja Suomen dokumenteissa. Standardisointisuunnitelmia oli eniten Suomessa, Ruotsissa ja Norjassa. Suunnitelmia tiedon saatavuuden parantamiseksi oli pääasiassa mainittu Ruotsissa ja Norjassa.

Indikaattorityössä lähtökohdaksi otettiin OECD:n määrittämät potilastietojärjestelmän (Electronic Health Record EHR), tiedonvaihdon (Health Information Exchange HIE) ja henkilökohtaisen terveystietojärjestelmän (Personal Health Records PHR) avaintoiminnallisuudet – niiden saatavuus ja käyttöaste. Eri Pohjoismaiden kansallisten eHealth-kyselyjen saatavuus- ja käyttöastemuuttujia verrattiin OECD:n määrittämiin muuttujiin yhtäläisyyksien kartoittamiseksi. Pohjoismainen tutkijaverkosto täsmensi OECD-määritelmien epäselviä käsitteitä ja toiminnallisuuksia. Toiminnallisuuksien osalta täsmennykset kohdistuivat saatavilla olevan tiedon kattavuuden, täydellisyyden ja tarkkuuden tasoihin, toiminnallisuuksien integraatiotasoihin ja käytettyihin rakenteisiin vertailukelpoisuuden varmistamiseksi.

Tutkijaverkosto tuotti listan OECD-yhteensopivista ja vertailukelpoisista yhteispohjoismaisista EHR-, HIE- ja PHR–indikaattoreista, jotka löytyivät olemassa olevien kyselyjen kysymyksistä tai jotka saatiin eri Pohjoismaiden lokitiedoista. Joukosta valittiin kolme vertailukelpoisinta muuttujaa, joihin kerättiin ja raportoitiin tiedot kaikista Pohjoismaista palautteen keräämiseksi vertailukelpoisen tiedonkeruun vaatimasta työstä ja tulosten hyödyistä. Tiedonkeruu osoitti myös saatavilla olevan tiedon vertailukelpoisuuden tason.

Pohjoismainen eHealth-tutkimusverkosto on osallistunut OECD:n eHealth-indikaattoreiden muodostamiseen antamalla tulokset OECD:n eHealth-indikaattorityön käyttöön. Läheistä yhteistyötä on tehty Pohjoismaiden eHealth-ryhmän ja kansallisten eHealth-kyselyistä vastaavien organisaatioiden kanssa, jotta pohjoismaisista kyselyistä saadaan yhteensopivia. Tulevaisuudessa tehtävä työ edellyttää kattavan eHealth-indikaattorilistan tuottamista, jossa on muitakin toiminnallisuuksia kuin käytettävyys ja käyttöaste. Tätä varten analysoidaan kyselykysymyksiä, stategiatavoitteita ja kirjallisuutta, jonka jälkeen indikaattorit priorisoidaan ylhäältä-alas ja alhaalta-ylös -prosesseilla. Pohjoismaisia kyselyjä pyritään täsmentämään, ja keräämään Pohjoismaista määrittelyjen mukaiset indikaattoritiedot.

Hyvien indikaattoreiden kehittäminen edellyttää selkeitä ja yksiselitteisiä järjestelmien/toiminnallisuuksien määritelmiä. Jopa Pohjoismaissa, jossa eHeath-järjestelmät ovat suhteellisen samanlaisia, on kohdattu haasteita tiedon vertailukelpoisuudessa. Nykyinen tiedonkeruu ei tuota vertailukelpoisia tuloksia, vaan tarvitaan tiedonkeruuinstrumenttien uudelleenmäärittelyä. Strategiadokumentit ja kyselyiden kysymykset uudistetaan säännöllisesti, mikä johtaa painopistemuutoksiin niiden sisällössä. Tarvitaan siis myös mekanismi tärkeimpien tavoitteiden ja indikaattoreiden päivittämiseksi.

Tulevaisuudessa tehtävän työn tulee sisältää myös siirtymä saatavuudesta ja käyttöasteesta kohti tuotos- ja vaikuttavuusindikaattoreita (organisaatioon, kliiniseen työhön, talouteen jne. kohdistuvia). Näiden osalta eHealth-indikaattorityö täytyy integroida vallitsevaan terveysindikaattorityöhön. Avaintoimijoiden täytyy olla mukana arvioimassa havaittujen indikaattoreiden tärkeyttä. Saatavuuden, käyttöasteen ja tuotosten mittaamisessa tarvitaan pääsy tilastotietoihin ja lokitietoihin, jotta päästään kohti luotettavampaa ja automaattisempaa indikaattorien tiedonkeruuta. Loki- ja tilastotietojen käytöstä eHealth-seurantatarkoituksiin täytyy päästä sopimukseen. Jo nykyisessä työssä etusijalle asetettava tietolähde jokaisen kysymyksen kohdalla pitäisi osoittaa selvästi, jotta tiedon luotettavuutta voidaan arvioida. Yhteisille indikaattoreille ja kysymyksille tarvitaan yhteisesti jaettu säilytyspaikka nykyisten indikaattoreiden ja toteutettavien päivitysten ylläpitämiseksi Pohjoismaissa. Yhteistyötä OECD:n sekä Pohjoismaiden eHealth-ryhmän kanssa tarvitaan jatkossakin, jotta indikaattoreiden kehittäminen kiinnitetään niihin toimintoihin, joissa tuloksia tarvitaan.

Avainsanat:

- Lääketieteen informatiikka.
- Terveydenhuollon tietojärjestelmät.
- Benchmarking.
- Terveydenhuoltopolitiikat.
- Strategianmukaisuus.
- Laatuindikaattorit.
- Terveysindikaattorit.
- Kustannus-hyöty-indikaattorit.
- Strategia-analyysi

8. Sammendrag

Denne rapporten presenterer metoder og de første resultatene av en analyse av eHelse-strategidokumenter og utvikling av et felles sett av indikatorer for bruk og nytteverdi av eHelse systemer i de Nordiske landene. Arbeidet er et resultat av ett års arbeid i det nordiske forskernettverket for eHelse, et forskernettverk som ble etablert som en undergruppe av Nordisk ministerråd sin eHelsegruppe. Arbeidet har vært gjennomført i perioden 15. februar 2012 til ultimo mai 2013.

Mulige indikatorer har blitt kartlagt i en fire-faset prosess:

1. Definisjon av kontekst (kartlegging av de primære interessentene samt det område eller systemet som er relevant for problemet som skal studeres).
2. Definisjon av målsettingene gjennom å kombinere en top-down og bottom-up-tilnærminger.
3. Definisjon av metoder for utvelgelse av indikatorer og kategorisering.
4. Definisjon av data, rapportering og oppsamling av tilbakemeldinger.

Arbeidet hadde to tilnærminger: Man gjorde en analyse av eHelse-strategier fra fire nordiske land, og man gjorde en analyse av OECD-definerte funksjonaliteter for elektroniske pasientjournaler (Electronic health records, EHR), elektronisk kommunikasjon (Health information exchange, HIE) og egenjournaler (Personal health records, PHR).

Kontekst og målsettinger ble definert gjennom en analyse av et utvalg av nordiske eHelse-strategi dokumenter. Gjennom en analyse av det tekstlige innholdet trakk man ut tre typer utsagn fra dokumentene: Utsagn/setninger om målsetninger, beskrivelser av interessenter og beskrivelser av tiltak for å realisere målsetningene. Metode og data ble definert med utgangspunkt i foreløpige resultater fra et indikatorutviklingsarbeid i regi av OECD.

Eksisterende data fra nasjonale eHelse-undersøkelser ble så analysert for finne ut om noen av de dataene som var samlet inn sa noe om de valgte indikatorene. Upresise definisjoner ble forsøkt presisert for å sikre at dataene fra de ulike landene faktisk var sammenlignbare. For noen indikatorer ble helt nye data samlet inn.

Analysen av strategidokumentene viste at alle strategidokumentene inneholdt erklæringer om kvalitetsforbedring, effektivitet og selvstendighet hos pasientene, samt om bedre tilgang til relevant helseinformasjon, informasjonssikkerhet, personvern og sekundær bruk av data.

I den danske strategien var erklæringer om effektivitet fremtredende. I den svenske strategien ble det lagt større vekt på bruk av IKT som verktøy for å skape endringer i helsetjenesten. I de norske og danske strategiene var prosesstøtte en viktig prioritet. Sverige og Danmark vektla betydningen av å bedre brukervennligheten i systemene, mens forbedring av IT-arkitekturen var et fokus i Finland. Alle strategidokumentene beskrev ulike tiltak for å etablere felles IT-tjenester. Norge og Sverige fokuserte på IT-tjenester for klinikere, mens Sverige og Finland fokuserte mest på tjenester for pasienter.

Planer for standardisering var mest fremtredende i Finland, Sverige og Norge. Planer for å øke informasjonssikkerheten og personvernet hadde betydning i den finske strategien. Planer for å bedre tilgang til data for sekundær bruk var primært nevnt i Sverige og Norge.

Det nordiske arbeidet har vist betydningen av å definere konteksten. Indikatorarbeidet tok utgangspunkt i indikatorene som er i ferd med å bli utviklet i OECD. Under arbeidet ble det oppdaget at det var nødvendig å spesifisere beskrivelsene av funksjonalitetene som OECD indikatorene handler om.

Indikatoranalysen og definisjonsarbeidet resulterte i en liste med OECD-kompatible indikatorer på områdene elektronisk pasientjournal, elektronisk kommunikasjon og egenjournal. De dataene som ble brukt stammet delvis fra ulike spørreundersøkelser som allerede var gjennomført eller ble trukket ut fra loggdata i de nordiske landene.

I rapporten presenteres noen som ble samlet fra eksiterende kilder, og viser graden av sammenlignbarhet av eksisterende data. Analysen spesifiserte OECD-spørsmålene/variablene, og metadata som gruppen mente var nødvendig for å frembringe sammenlignbare resultater. Tvetydige begrep ble definert. Spesifikasjonene av metadata fokuserte på grad av forståelighet, helhet og nøyaktighet av data, integrasjonsnivå av funksjonalitetene og strukturene som ble benyttet.

Det nordiske eHelsenettverket har brukt resultatene fra OECD sitt eHelse-indikatorarbeid, men samtidig forbedret de samme OECD indikatorene gjennom å beskrive dem mer presist og definere de nødvendige metadata. Sammen med den nordiske eHelsegruppa har nettverket bidratt til en bedre samordning av de nordiske undersøkelsene og en bedre integrasjon med organisasjonene som er ansvarlige for de nasjonale eHelseundersøkelsene.

Forfatterne konkluderer at det ikke kan utvikles gode indikatorer uten at systemene og funksjonalitetene er klart og entydig definert. Til og med i nordiske land, der eHelse systemene er ganske like, oppstår det utfordringer mår man skal sammenligne data. Man bør derfor redefinere de skjemaene som skal brukes for datainnsamling.

Innholdet i de offisielle strategidokumentene revideres jevnlig. Et tema kan bli trukket fram i en periode bare for å bli lagt vekk når det et blitt løst, og så bli erstattet av et nytt. Noen utviklinger kan finne sted uten at det noen gang har vært nevnt i en policy. For å få et fullstendig bilde av eHelse-utviklingen kan det bli nødvendig å etablere andre indikatorer enn de som er beskrevet i eHelse strategidokumentene.

I framtiden kan det også bli nødvendig å flytte fokuset fra kartlegging av tilgang og bruk av systemer til å kartlegge hvilke resultater bruken av systemene har gitt (for eksempel organisatoriske endringer, kliniske og økonomiske resultater). Det kan bli nødvendig å gå i dialog med de ulike intereressentene for å diskutere betydningen av de indikatorene som er blitt plukket ut. Man bør finne ut om det er mulig å bruke statistiske data og logger for å måle tilgjengelighet, bruk og resultat på en pålitelig og automatisert måte. eHelse indikatorarbeid bør integreres med annet indikatorarbeid.

Det er nødvendig å arbeide for å oppnå enighet om hvordan logger og statistiske data skal kunne brukes som kilder for data om bruk og nytteverdi av eHelse systemer. For hvert spørsmål bør påliteligheten testes. Det kan bli nødvendig å etablere en felles database av indikatorer og spørsmål. Samarbeidet med OECD og den nordiske eHelsegruppen er viktig for forankringen av resultatene. Det bør være god kontakt mellom de som arbeider i Norden og arbeidsgruppene i OECD.

Emneord:

- Helseinformatikk.
- Helsetjenesteforskning.
- Benchmarking.
- Helsepolicy.
- Evaluering.
- Kvalitetsindikatorer.
- Kostnad-nytte.
- Strategi analyse.

9. Annex 1

Mandate for the Research Network

- Denmark
- Finland
- Iceland
- Norway
- Sweden

And of the

- Faroe Islands
- Greenland
- Aaland

9.1 Objective

The aim of this mandate is to establish a network of research organisations within the Nordic countries, Greenland, the Faroe Islands, and Aaland that can develop, test and assess a common set of indicators for monitoring eHealth in the Nordic countries, Greenland, the Faroe Islands, and Aaland for use by national and international policy makers and scientific communities to support development of Nordic welfare.

9.2 Background

ICT-facilitated solutions in health care (eHealth solutions) have been recognized as key enablers for modern, patient-centred and efficient healthcare services. Diffusion of these solutions has rapidly increased the importance of monitoring their progress and impacts so as to learn from these initiatives. For this, adequate valid indicators are needed.

Through the Nordic Council of Ministers (NCM) the Nordic countries, Greenland, the Faroe Islands, and Aaland are learning from each other regarding eHealth implementation. Today there are national-level monitoring activities but no harmonisation of data collection, which would be a prerequisite for benchmarking and learning. Nordic countries are also collaborating in the OECD and need to follow the eHealth indicator work in that context.

9.3 Organisation

The NCMs eHealth group consists of one representative per country (the Nordic countries, Greenland, the Faroe Islands, and Aaland) which is nominated by the respective countries' ministries. The Nordic eHealth Research Network will be established as a subgroup of the NCMs eHealth group.

Each ministry in the Nordic countries, Greenland, the Faroe Islands, and Aaland is responsible for appointing national representatives to the Nordic eHealth Research Network. Each country can appoint up to two organizations that can participate in the international meetings of the Nordic eHealth Research Network at the expense of the NCM eHealth group as stated in section 7. One of these organizations shall be in charge of, and responsible for, the work and results to be carried out in accordance with the Mandate on behalf of the country it represents. The other organization(s) will participate under the responsible organization's leadership. One of the Responsible Parties will be given the responsibility of managing the Nordic eHealth Research Network.

It is the national representative mentioned below that will act as responsible organization in each country. By agreeing to this mandate the research organizations mentioned below are mandated by their national ministry to act as the responsible party in the Nordic eHealth Research Network, and to take part in research activities described in this mandate.

9.4 Contractual issues

THL and NTNU are individually in charge of separate responsibilities in the project as stated in a separate contract:

- THL: A report on the results from collaboration on the OECD indicators including a set of Nordic eHealth Indicators and publications on testing and assessment of results gained with developed data collection tools for IS success indicators.
- NTNU: A report on the Nordic eHealth policy analysis, common goals, existing available data, comparison of existing results and needs for developing data collection.

The contract regulates issues related to responsibilities, rights and public disclosure and is entered into between the Norwegian Directorate of Health and THL/NTNU.

9.5 Mandate period

The mandate is valid for the period of 15.02.2012 to 04.05.2013.

9.6 Work plan

(Details presented in Annex 1 and 2 of the Mandate).

- Present a progress report on Nordic eHealth research and collaboration with OECD indicators work (7. – 9.5.2012). Present a summary of Nordic eHealth research until the end of the mandate period, and cooperation with the OECD global indicator process.
- Present a report on the Nordic eHealth policy analysis, common goals, existing available data, comparison of existing results and needs for developing data collection (18.09.2012 – Nordic eHealth Conference, Trondheim).
- Submit and present a draft report on the results of the collaboration on the OECD indicators and with a draft set of Nordic eHealth Indicators (18.9.2012).
- Submit a report on the results from collaboration on the OECD indicators including a set of Nordic eHealth Indicators and publications on testing and assessment of results gained with developed data collection tools for IS success indicators (01.12.2012). A suggested next step work plan for year 2013 – 2014 is presented in Annex 2.

From these deliverables plus the work plan for the next years (Annex 1), the Nordic eHealth Research Network will collate a publication manuscript for NCM by the end of the first quadrant of 2013.

9.7 Costs

Participations in the Nordic eHealth Research Network will reimburse justified, reasonable and actual travel expenses for up to 2 representatives per country per meeting, up to a maximum 4 meetings per year. Travel expenses will be compensated on the basis of reimbursement forms (with attached original travel receipts) sent to the Norwegian Directorate of Health by each Research organisation participating in the Nordic eHealth Research Network.

THL and NTNU will receive additional remuneration for its responsibilities in the project as stated in the separate contract.

9.8 Proprietary rights and intellectual property rights ("rights")

Nordic Council of Ministers (NCM) owns the right to publish results from/achieved by the Nordic eHealth Research Network in a NCM Report, of which the Nordic Council of Ministers holds ownership, in any existing and future forms and is entitled to translate the report into other languages. The Nordic Council of Ministers is entitled to use the results of the report in its activities and grant other parties a similar right to use the results. The Nordic Council of Ministers are entitled to produce copies of any final report or interim reports resulting from the report, the right to make the results of the report available to the general public in accordance with Section 4.2 (in the separate contract) and the right to use the results in further research and reports. The right of beneficial use does not comprise commercial exploitation unless otherwise agreed. Copyright and the right to use collected data and methodology remains with the Nordic eHealth Research Network.

In connection with the report the Nordic eHealth Research Network can bring in know-how, information and materials ("background knowledge") protected by proprietary rights, intellectual property rights or as trade secrets and which have been produced independent of the report. Examples of background knowledge are analysis tools, methodology and raw data. The Nordic eHealth Research Network can use such

protected background knowledge to the extent this is necessary to perform the report. The Nordic Council of Ministers shall be entitled to use such protected background knowledge from the Nordic eHealth Research Network to the extent that this is necessary to exploit the rights to the results of the report under this agreement.

The Nordic Council of Ministers and Nordic eHealth Research Network cannot use the results of the report, background knowledge and raw data in such a manner that infringes on the duty of confidentiality under Section 4.3 or statutes or other agreements, or if the use conflicts with a third party's rights.

Originators are entitled to be named in keeping with proper usage, cf. Section 3 of the Copyright Act. All use of the results of the report shall take place with the framework for generally accepted research practice. In the results the Nordic eHealth Research Network must also state to what extent the Nordic Council of Ministers has funded the report.

9.9 Public disclosure

The results of the report shall be made public after handover to the Nordic Council of Minister. If the Nordic Council of Minister does not make the results public within three weeks of handover, the Nordic eHealth Research Network shall be entitled to do so. The party making the disclosure decides where and in which manner this is done.

To the extent legitimate considerations so dictate, a party can demand that public disclosure be postponed. Legitimate considerations can be that a party shall have a reasonable period of time in which to secure protection of the results through a patent application or because this is necessary due to competitive reasons or other current research work, or if there are considerations that allow postponed disclosure pursuant to the Freedom of Information Act of 19 May 2006 no. 16. Any patent applications must be filed no later than six months after the conclusion of the report.

The Nordic eHealth Research Network and its employees that have contributed to the performance of the report can publish scientific results from the report. The publication must state that it has been prepared in connection with a report funded by the Nordic Council of Minister.

When communicating the results of the report externally, the Nordic eHealth Research Network shall undertake to name the originator in keeping with proper usage, cf. Section 3 of the Copyright Act. The extent

to which the Nordic Council of Ministers has funded the report must also be stated.

9.10 Confidentiality

The Nordic eHealth Research Network parties are subject to a duty of confidentiality pursuant to Sections 13–13f of the Norwegian Public Administration Act and relevant special legislation. This entails inter alia that the Parties have a duty to prevent others from gaining access to or knowledge of information they obtain about personal matters in connection with the report that may be important not to disclose for competitive reasons.

The Nordic eHealth Research Network shall also observe confidentiality regarding other matters it gains knowledge of as part of the Nordic eHealth Research Network and which the Parties understand or should understand is important not to disclose.

Information covered by the first or second paragraph, and which is necessary for performance as part of the Nordic eHealth Research Network, can be presented in an anonymous form if consent to make public has not been obtained or there is no other legal authority for public disclosure.

The Nordic eHealth Research Network is responsible for ensuring that informants are guaranteed anonymity in compliance with a declaration of consent and generally accepted research principles, also vis-à-vis the Nordic Council of Ministers.

9.11 Annex

Annexed to this mandate is:

- Work plan 2012 and suggested next step work plan 2013–2014.
- Tasks and their timing (year 2012).

9.12 Work plan 2012 and suggestion for 2013–2015

Year 2012

- Agreeing on the need and uses of indicators (15–16.2.2012).

- Defining the context (human and environmental) for measurement.
  - Identifying key stakeholders – users of indicator information and their needs.
  - Defining the functionalities or systems that are relevant to the problem being studied.
- Defining the goals for measurement per stakeholder group.
  - National Policy makers:
    - Building a demo of OECD indicators (7.5.2012).
    - Monitoring attainment of national eHealth policy goals ("top-down" indicators).
  - Scientific Community: Monitoring success of eHealth interventions ("bottom-up" indicators).

- Defining methods for indicator selection, categorization and testing according to the modified RAND-methodology.
  - 2012: Building a demo for OECD indicators for WoHIT 2012.
    - Reviewing existing national level data compatible with OECD indicators, agreement on data included and identification of compatible variables included in the demo (16.2.2012).
    - Agreeing on process, rights and responsibilities of sharing data and the making of comparative analyses from the national results for the Nordic OECD demo (including copyright issues) (15–16.2.2012).
    - Collection of datasets for compatible (and potentially compatible) variables in each country, (making necessary calculations for potentially compatible variables in each country), sharing data, solving possible questions that emerge when reviewing the data.
    - Agreement on format of reporting national results, provision and sharing of results.
    - Presentation of the Demo in WoHIT 2012 (7–9.5.2012).
    - Publishing report of the work and demo results (by end of 2012)
  - 2012: Monitoring attainment of eHealth policy goals (Top-down):
    - Reviewing eHealth policies -> systems implemented, policy goals, listing of indicators for attainment.
    - Rating of indicators by national experts in a panel, generating consensus for common Nordic eHealth Policy Indicators.

        - Reviewing of availability of data by comparison of national surveys, statistics, log files etc.
        - Testing the available and compatible data collection, reporting and feedback from user groups.
        - Report of the results and needs for developing data collection.
- 2013–2015: Monitoring success of eHealth interventions (scientific, Bottom-up):
    - Reviewing eHealth literature -> listing potential policy and scientific indicators.
    - Rating by national experts in a panel, generating consensus for common Nordic eHealth Success Indicators.
    - Review of availability of data by comparison of national surveys, statistics, log files etc.
    - Testing the available data, reporting and feedback from user groups.
    - Report of the results and needs for developing data collection.

Table 21. Tasks and their timing (year 2012)

		2012				2013	
		Q1	Q2	Q3	Q4	Q1	Q2
WP1 Management of the research group (lead THL)	Planning of the work: work plan, group meetings, reporting						
	Administration (lead of contractual, mandate issues, funding)						
	Collating the reports for NCM (THL) including:				x		P
	Policy analysis report wp 3.3 (NTNU)			x			
	Report on results from collaboration from OECD indicators and with draft set of (OECD-compatible) Nordic eHealth Indicators wp 2.1 (THL)			x			
	Next step work plan for year 2013 – 2015 (all)			x			
	Progress report on Nordic eHealth research and collaboration (7–9.5) (THL)			R			
	*Conceptual definitions (Sweden to take the lead)			x			
WP2 Identification of OECD-compatible and common Nordic *EHR and HIE* indicators and results (lead THL)	Identification of OECD-compatible Nordic *EHR and HIE* availability Indicators from eHealth surveys						
	*Feedback on work done so far from WoHIT and NCM eHealth group, comparison with summary record of the OECD Paris workshop (by Pisa 26th August 2012)(THL)						
	*Updating OECD EHR and HIE functionalities availability metadata and statistics for medication list and selected other OECD functionalities (transmission of prescriptions, electronic messaging), further demo's (Trondheim Sept 2012) (THL)						
	*OECD PHR and telemedicine functionalities availability						
	Plan for 2014–5: Analysis of existing survey, log, statistical variables beyond availability of key EHR, HIE, PHR and telemedicine functionalities – grouping, soundness and feasibility, identification of existing Nordic metadata and statistics (demos) [2014 – 2015]						
	use of key functionalities						
	usability of key functionalities,						
	impacts of key functionalities (SFMI)						
WP3 Nordic eHealth policy analysis (lead NTNU)	First draft of Nordic eHealth policy analysis (NTNU).						
	Validation of preliminary policy analysis results (It was agreed in Oslo that Denmark would do this)						
	Comparison of list of variables and policy goals, identification of stakeholder needs and priorities (joint work with WP1 and 2) (2013) – lead Norway						
	Reporting the results (NTNU)						
WP4 Communication and exploitation of results	*Communicating results to the national survey and other data type developers (all) to develop and harmonise monitoring activities in different countries						
	*Communicating results to OECD eHealth indicator task forces to further harmonize data collection (THL, others)						
	Scientific communication (all)						
	Collection of feedback on relevance, importance of common Nordic monitoring data (all)						

Mandate (version 0.5) text for work plan 2012

Updates: *Copenhagen
email discussion

10. Annex 2

Handout in the Copenhagen conference

The Nordic eHealth Research Group

KTH Royal Institute of Technology

Norsk senter for elektronisk pasientjournal

NATIONAL INSTITUTE FOR HEALTH AND WELFARE

AALBORG UNIVERSITY

A group of researchers from the Nordic countries has worked on developing a joint set of indicators that can be used to monitor the availability and use of eHealth technologies in the Nordic countries. The comparable indicators can either serve the purpose of international benchmarking or comparison of the quality and outcomes of specific strategic initiatives. Because measures based on indicators inevitably will have a significant structural component, the comparison of strategic initiatives can only be done meaningful between countries with rather similar structures as in the Nordic countries.
The indicator data is either log data harvested from the production systems or obtained from surveys of users. The data has been collected through a number of years and includes indicators on key functionalities of Electronic Health Record systems (EHR), Health Information Exchange (HIE), and Personalized Health Record systems (PHR).

The Nordic eHealth Research Group will present some results at Medical Informatics Europe (MIE) Congress to be held in Pisa, Italy August 26-29. Abstracts of the presentations are presented below.

Development of Indicators to Monitor Availability and Use of EHR, HIE and PHR Systems

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Abstract. This panel discusses various aspects of providing constructive feedback to the development and implementation process of eHealth technologies. Most countries have high-level policy documents on eHealth, but few have models for providing evidence of management of eHealth infrastructure and application systems. Even fewer have arrangements that systematically measure effects of eHealth systems on the health care of patients and citizens. During this session the panelists will present dimensions and categories of evidence used to support strategic eHealth decisions in the Nordic countries. They will also discuss differences, similarities, and efforts to develop common Nordic indicators to monitor adoption, use, progress,

Developing quality indicators for IT interventions in health care

Nicolette DE KEIZER[a], Hannele HYPPÖNEN [b], Elske AMMENWERTH [c]
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[b] *National Institute for Health and Welfare (THL), Helsinki, Finland*
[c] *Univ of Health Sciences, Medical Informatics and Technology, Hall in Tirol, Austria*

Abstract. In this workshop we will present and discuss a methodology for developing quality indicators for IT interventions. The method combines scientific evidence and expert opinion using a rating and consensus technique. The proposed methodology will be presented based on a case study of indicators for CPOE systems. The audience will work in smaller groups (based on their interest in a particular type of health IT system) on how to apply the methodology on certain types of health IT systems.

eHealth indicators: results of an expert workshop

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[e] *Centre for User Oriented IT Design, Royal Institute of Technology, Stockholm, Sweden*

Abstract. eHealth indicators are needed to measure defined aspects of national eHealth implementations. However, until now, eHealth indicators are ambiguous or unclear. Therefore, an expert workshop "Towards an International Minimum Dataset for Monitoring National Health Information System Implementations" was organized. The objective was to develop ideas for a minimum eHealth indicator set. The proposed ideas for indicators were classified based on EUnetHTA and DeLone & McClean, and classification was compared with health IT evaluation criteria classification by Ammenwerth & Keizer. Analysis of the workshop results emphasized the need for a common methodological framework for defining and classifying eHealth indicators. It also showed the importance of setting the indicators into context. The results will benefit policy makers, developers and researchers in pursuit of provision and use of evidence in management of eHealth systems.

Exploring a methodology for eHealth indicator development

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Abstract. Indicators provide a practical method to monitor and benchmark eHealth progress towards objectives set in local, national and international policies, and to offer evidence for eHealth management. There is no agreed methodology to develop and define these indicators. The purpose of this paper is to present a proposal for an indicator development methodology and indicator classification. This proposal combines expert-led, top–down and community-based bottom–up approaches. It offers a holistic approach for developing indicators for measuring progress and impacts of eHealth development consisting of four phases: (1) defining the context for measurement, (Ref. no. 2) defining the goal of measurement, (Ref. no. 3) defining the methods for indicator selection and indicator categorization and (Ref. no. 4) defining the data to be collected and analyzed to calculate the indicator. Our preliminary results will be used as a starting point for developing a more detailed description of methods for indicator

11. Annex 3

The first joint Nordic eHealth indicators

Table 22

Indicator group	Indicator name	Question	Informants
EHR	Medication list availability	Does your electronic system allow you to perform the following functions electronically: 1) list medications of an individual patient? Yes/No How comprehensive is the list geographically (organisational/ regional/ national/ international) How comprehensive is the list institutionally (public/ private/ambulatory/hospital) How accurate is the list (prescribed/dispensed/OTC/taken) How complete is the list (electronic/paper/phone/fax)	Log, CIOs
EHR	Medication list use	To what extent are the medication lists (defined in question 1) used in clinical care of the patients? all the time, most of the time, some of the time, rarely, never	Clinicians
HIE	Electronic Prescribing availability	Does your electronic system allow you to 1) Send a prescription electronically to the pharmacy ? Yes/No What is the degree of integration? (separate system/ integrated to EHR) At which level can it be dispensed? (specific pharmacy/regional pharmacies/nationally/ internationally) What codes are used for medication?	Log, CIOs
HIE	Electronic Prescribing use	To what extent is electronic prescribing used in your organisation? (all the time, most of the time, some of the time, rarely, never) OR proportion of electronically transmitted prescriptions of all prescriptions made in the organisation	statistical data OR Clinicians
PHR	Appointment booking availability	Is it possible for clients to book appointments electronically with your organisation? YES/ NO Which options are there for booking? Choose-book (web access)/ accept-book (e.g. SMS access) For which services is the booking possible? (Laboratory, dental health, maternity care, imaging…) What is the scope of user access? (Local/ regional/ national portal)	CIO, logs
PHR	Appointment booking use	What is the proportion of electronically made bookings in your organization per service?	Statistics, logs, CIO

12. Annex 4

Policy analysis and indicator data (Iceland)

The eHealth strategic plan of the Icelandic health authorities supports the implementation of an interoperable electronic health record at a national level, for every citizen, securely accessible and shareable to authorized professionals at the point of care, and across geographical boundaries. Furthermore, citizens shall have secure access to their own personal health information. The aim is to improve the quality of care, increase patient safety, and improve the efficiency of the health care system. Moreover, emphasis is on improving access to relevant health statistics to support decision-making at all levels of healthcare; clinical, administrative and policy levels.

12.1 General aims/goals

- Statements about healthcare services: Similar to the other Nordic policy documents on eHealth, the Icelandic policy document contains affirmations about increasing the quality and effectiveness of healthcare services through the use of IT within healthcare.
- Statements about health-IT (eHealth) services: The Icelandic policy document also addresses the importance of using health IT to improve access to relevant health information to promote continuity of care and increase patient safety. The policy document contains goals on seamless data sharing across healthcare institutions and geographical boundaries. Moreover, the emphasis is on improving information security and patient privacy.
- Goal statements about the empowerment and activation of patients/citizens: The Icelandic policy document includes goals in relation to increased patient empowerment.

12.2 Measures/plans to achieve the particular purpose

- Plans for establishing IT architectures and IT-services: The Icelandic policy document includes plans to establish common IT architectures and patient portals.
- Plans for standardization: The Icelandic policy document includes plans for increased standardization to support data sharing and benchmarking.
- Plans to enhance information security and privacy: The Icelandic strategic document includes plans to enhance information security and privacy, e.g. by implementing special eID cards for healthcare professionals and by enabling patients to monitor who has accessed their health record.
- Plans to improve access to data for secondary use: The Icelandic strategic document includes plans to improve access to both clinical and administrative data to meet policy, administrative institutional, clinical, public, and academic requirements.
- Plans for establishing law and regulatory frameworks: The Icelandic policy document includes plans to increase regulatory frameworks.

12.3 Stakeholders identified in strategy documents

The Icelandic policy document includes statements about healthcare professionals, patients, administrators, policy makers, and academia.

Availability and use of a complete list of Medications that the patient is taking

ePrescriptions were implemented in Iceland in 2009. To date clinicians only have electronic access to ePrescriptions, but not to dispensed medication, paper or phone prescriptions. A project has now been launched, under the auspices of the Directorate of Health, to have the complete medication list available (including dispensed, paper and phone) via a public health portal. First only physicians (end of 2012) will gain access, then other healthcare professionals and consumers of health early next year. The function is integrated into the EHR. The security level calls for eID cards.

Availability of electronic transmission of prescriptions

In Iceland transmission takes place via a national server and is integrated into the EHR system. The proportion of electronically transmitted prescriptions is approximately 55% (2011), which is lower than antici-

pated, considering that a great majority of physicians (more than 90%) and all pharmacies have access to the ePrescription system.

Availability of Secure messaging between carer and patient: electronic booking

In Iceland, Electronic booking of visits is currently available in public primary health care within the Capital area and some private physicians' offices. The proportion of bookings made electronically in Iceland is not known at this point in time.

13. Annex 5

Progress report from first year's activities of the Network

Table 23. Meetings in 2012

Date	City	Participants	Meeting Aim/agenda	Outcome
15.–16.02	Helsinki	2 Ålborg, DK 1 NTNU, NO 1 KTH, SE 5 Univ Oulu/THL, FI	To agree on methods and work plan, revision on preliminary work1 To present the project for the NCM eHealth group	Decision to establish NeRN as subgroup of NCM eHealth group, and to present at WoHIT 2012. Definition of framework for the subchapter presenting the first results
19.04	Oslo	2 Ålborg, DK 1 NTNU, NO 1 Dir of Health, NO 2 SFMI, SE 2 Univ Oulu /THL, FI	To discuss NCM mandate, status of work, results of policy analysis and joint indicators, dissemination	Provision of the first results of the work packages concerning policy analysis and joint indicators
08.05	Copenhagen	2 Ålborg, DK 1 NTNU, NO 2 SFMI, SE 1 THL, FI	To finalise and coordinate the presentations, and to deal with admin issues and the future work plan	Provision of PPT-slides to be presented at High level eHealth and WoHIT conferences
21.–22.08	Helsinki	2 Ålborg, DK 2 NTNU, NO 2 THL, FI	To agree upon mandate, contracts, reporting deadlines, and discuss the future work plan, dissemination (MIE, HelsIT and website). To agree on questions for Danish survey in September.	Agreement on validation process of policy analysis, and on presenting two more demos of joint indicators, update on current and future work plan, plan for presentation on HelsIT and web, agreement on finalisation of Mandate and Contracts. Presentation for the NCM eHealth group.
28.11	Stockholm	2 NTNU, NO 1 Dir of Health, NO 2 SFMI, SE 3 Univ Oulu/THL, FI 1 Estonia	To agree upon the final report and its publication forums	Editing and agreements on the final report last updates, Preparation of proposal for the NCM eHealth group for final report to be published in the NCM series, agreement on MIE submission

1 Preliminary work on comparison of the different surveys against the OECD indicators

Table 24 Presentations at conferences 2012

Date	City/event	Events/forums
7. – 9..5.2012	Copenhagen: High level eHealth conference and WoHIT	WoHIT, presentations of the first results: during delegation lunch, state secretary opening at FinlandPlaza at Finnish, Swedish, Norwegian and Danish eHealth stands in brochure (Annex 2) in NCM eHealth group meeting (future plan and policy analysis preliminary results)
26.– 29.8.2012	Pisa: Medical Informatics Europe Conference (MIE) 2012	MIE, presentations: scientific paper: results of Oslo workshop (Hyppönen et al, 2012) scientific paper: methodology for indicator definition (Hyppönen, Ammenwerth & de Keizer, 2012) panel discussion with the following objectives: present dimensions and categories of evidence used to support strategic decisions in the national eHealth system design, implementation and redesign, discuss differences, similarities, needs and efforts for national indicators to monitor adoption, use, quality, and effects of national eHealth system implementations Suggest measures needed to generate an agreement on a minimum international dataset. Issues: Methodological and organizational approaches, recent data, feeding data to a strategic level for the benefit of policy makers.
18. – 20.9.2012	Trondheim: HelsIT Conference	HelsIT, presentations: on the background of the Research Network and indicator work on policy analysis on results of recent Finnish national surveys

The web page for the Nordic eHealth Research Network (NeRN) can be accessed via the following link: www.thl.fi/nordicehealth.

14. Annex 6

An example of measures beyond availability and use

Table 25

Dimension	Domain, Category	Measure
Information System quality	Stability [31] Reliability [32][34][17]	The information system I use as a tool in my work is reliable and stable
	Response time [31][34][17] Efficient to use [32]	The information system has a fast reaction time
		Compilation of statistics takes too much time
	Ease of use [31][17]	Fields and functions in windows are logically placed
		Searching, documenting, checking and editing patient information is easy
		The information system tells me clearly what is going on and the outcome (e.g. saving of data)
		Terminology (e.g. headings) is clear and understandable
		The system process model is stiff and does not fit to my work process.
		Performing routine tasks is simple and can be done without too many 'clicks'.
	Easy to learn [32][17]	Information system use logic is easy to learn
		Use of the system does not require long training
	System errors[31] Few errors [32] Error rate [17]	Documented data disappears sometimes from the system
	Compatibility [32] Integration of systems [17]	It takes too long time to sign in to use the systems
	Type of features and level of decision support [34] Usefulness of specific functions, DSS [17]	The systems offer enough reminders, warnings and other decision support.
		Usefulness of specific functions
Service quality	Responsiveness [34], User training, technical support [34]	I get enough help in problems related to Information systems use
		Big portion of my working time is spent solving problems with information technology

Dimension	Domain, Category	Measure
Information quality	Availability [33], Accessibility (distance, availability)[34][17]	Radiology results are easily available
		Information about medication prescribed in other organizations is easily available
		Accessing patient information from other organizations takes too much time
	Content quality [33], Completeness, accuracy, relevance, comprehension, consistency [34][17], precision, currency, timeliness, reliability, completeness, format [17]	Laboratory results are presented in a logical format
		Patient data (also from other organizations) is comprehensive, timely and reliable
		Information system provides a summary view about the situation of the patient
		Nursing record content is easy to read
		Patient's medication list is clearly presented
User satisfaction	Satisfaction [34]	School grade given to the Information system (scale: 4–10), relative amount of A's (9–10 = excellent) and D's (4–5 = poor)
Use	System usage [34]	Frequency, duration, location, type and flexibility of usage [34]
Net benefits/ outcomes	Productivity: Efficiency of care (resource utilization, output improvements, management improvements, effects on patient flow [34]	The Information systems help reduce duplicate tests.
	Quality of care [34]: Appropriateness effectiveness (Adherence to guidelines, continuity of care [34] Heath outcomes [34]	Information systems help to achieve continuity of care
		Information systems help improve health outcomes
	Quality of care [34]: Patient safety (preventable adverse events, near errors, reduction in patient risks) [34]	The system has caused or nearly caused a serious adverse event to a patient
		The Information systems help prevent medication errors
	Care co-ordination (doctor–nurses) [34]	The system monitors reception of orders I have given to nurses.
		System supports flow of information between doctors and nurses
	Care co-ordination (doctor–doctor within organisation) [34]	System supports flow of information between doctors in same organisation
	Care coordination (doctor-doctor between organizations [34]	System supports flow of information between doctors in different organizations

Dimension	Domain, Category	Measure
	Care coordination (doctor-patients) [34]	System supports flow of information between doctors and patients
	Patient-centeredness of care	The information systems use requires too much attention away from the patient
	Support for development of own work[31]	The information systems support development of my work

Source: the Finnish survey for clinicians (29).

15. Annex 7

Communication with Greenland

The Government of Greenland has been enquired to participate in the research network behind this survey, and contribute with data to the mapping of the dissemination and use of health IT.

Hanne Vibjerg – Executive Assistant – from the Ministry of Health replied that they found it very interesting to work on common objectives for Nordic eHealth monitoring, particularly because telehealth and a national electronic health record is of special interest to the health system in Greenland – an area were a lot of resources have been allocated. They do not at this moment have systematic monitoring activities, but are very interested in further collaboration with the Nordic eHealth Research Group.

The research group will work to include the health professional users in Green-land in future surveys on dissemination and use of eHealth technologies.

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Nordic eHealth Indicators

Organisation of research, first results and the plan for the future

The Nordic eHealth Research Network was established in 2012 as a forum for policy makers and researchers to jointly work towards measurable policy goals and data that can be exploited to steer decision making related to goals and their implementation.

This report describes first results of the Network: eHealth policy analysis and first common Nordic eHealth indicators. The results show similarities and also some differences in the eHealth policies, priorities and implementation. Interesting similarities and differences in availability and use of eHealth services in the Nordic countries were found with the first comparable eHealth indicators.

The results create a basis for Evidence-based policy making as well as benchmarking and learning best practices from each other.

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