A Vision for the Use of ICT by Norwegian Healthcare in 2012

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Abstract. This paper presents how ICT is expected to be used by Norwegian Healthcare by the end of year 2012. The main forces influencing the ICT development are identified and the resulting set of new features is presented.

Keywords. Vision, ICT, healthcare

Introduction

As a partner with the central health authorities and as a consulting agency for the national IT healthcare sector, the Norwegian Centre for Informatics in Health and Social Care (KITH) needs to be up-to-date on the current development concerning the use of information and communication technology (ICT) in healthcare. In order to provide the best advice, we need to distinguish the forces that influence this development, establish how the various new features are interrelated and interdependent and identify any critical activities as early as possible.

For this purpose, KITH has performed a study in 2007 on how Norway will advance and integrate ICT in healthcare by the end of 2012. The expected new main features are identified and presented in this article.

1. Background

A vision is not a plan, but a visualisation of what is expected to happen. Like a plan, the final result may not be exactly as expected or occur at the scheduled time. In our case, we were to predict the status of ICT in healthcare by the year 2012.

Five years ahead is not any distant future. We would expect most of the development to be influenced by features that exist today. On the other hand, we know that revolutionary features may appear out of the sky and possibly have significant influence beyond that which we predicted.

Today, ICT is used in all parts of the healthcare environment from management of personnel and equipment to sophisticated technical instruments. For the purpose of this study, we have focused on the use of ICT in treatment processes and work flow of healthcare services more than on advances within technical equipment and management. This division is, however, not always obvious. We have also focused on the functional solutions that will be available and not on the specific technical and
organisational details that have to be in place. While ICT is important, we realize that organisational and other initiatives often are needed to achieve the full effects.

2. Method

In this study, in order to identify the upcoming new features, we have tried to identify the forces that are behind the development of ICT for use within healthcare.

2.1. Medical, Social and Political Development

New medical knowledge allows for treatment of increasingly more diseases, but such treatment typically requires the joint effort of several specialists due to increased medical specialisation. ICT is crucial for managing the increased communication resulting from this specialisation. Increased knowledge of an individual's genetic composition is also influencing the treatment.

The social factors that will affect development in 2012 are characterised by increased globalisation, an increased interest in one’s own health and an increase in the elderly population. ICT helps people to stay in their own home and ICT is a prerequisite for globalisation.

The political development in Norway pertaining to healthcare is expressed as political decisions concerning healthcare services in the future. This is published in a national plan for healthcare services [1], a plan for how to provide care for, mainly, the elderly people [2], a report on how to provide continuity of care in healthcare services [3] as well as a report on the future use of ICT, in general, in Norway [4].

2.2. Technical Development

The technical development continuously produces new possibilities, but healthcare is often reluctant to use them. Much of the development that is expected to be further developed, are improved communication solutions and access of information on the internet.

Other technologies will allow things to be done in a new way, such as service oriented architecture (SOA). There is also an increased focus upon semantic interoperability compared to technical interoperability, which has been in focus for a long time. Computer assisted decisions (CAD) and system biology are also techniques that are expected to be of increased importance.

New technologies include gene-technology, intelligent information systems, semantic web and nanotechnology. Use of nanotechnology is expected to have significant effects within medicine, although probably not before 2012.

2.3. Development in Other Countries

We have performed an internet study on what is being developed in other countries. Most of the information available is not specifically related to the use of ICT, but to healthcare in general. In addition, a large portion of the information is also from countries where healthcare services may not be directly comparable to Norwegian (or North-European) healthcare.
The information available indicates a very coherent view on this immediate development. Common features include, among others:

- Focus upon EHR as well as patient summaries
- Web-access to EHR for authorised personnel, including the patient
- Increased focus on patient services, including self-treatment
- Centralised web access points for various services ("Portals")
- Definition of integrated treatment sequences
- Information exchange, including ePrescribing

However, we identified significant deviating views of opinion in two areas:

- Some parties intend to register structured information in the EHR while others propose to enter free text and to extract the information using data mining.
- Some parties plan to make patient information available from a central repository of all EHRs while others propose to make this information available from where it is originally registered.

3. Expected Main Features

3.1. Infrastructure

**Use of ICT Equipment.** ICT-equipment will become available everywhere and the physical size will continue to decrease. By the end of year 2012, a combination of various wireless communication methods will allow ICT-equipment units to be connected to a network everywhere: bedside in the hospital, at home, during travel, etc. making all needed information always available.

**Better Coordination between Actors.** Modern medicine requires the cooperation of several healthcare workers and medical specialists. ICT will not only provide the means to transfer the information between the actors, but will increasingly be used to keep track of the logistics in this cooperation involving all involved resources, such as personnel, facilities and equipment.

**Improved Access to Patient Information.** Authorised healthcare personnel involved in the treatment of a patient will have access to all relevant information related to the task the actual person is performing. This access will be provided everywhere, irrespective of the organisation of healthcare services and how the EHR is being stored. Increased availability of medical information reduces the need for storing duplicate copies by all parties involved in the treatment of a patient; each actor may access the information when needed from the original source or alternatively a central store.

**Access Control.** Increased availability to patient information requires a sophisticated access control system. All users have to be authorised by an official health authority. Access is granted only for selected parts of the total medical record related to the task the actual person is performing (dynamic role) and the patient's actual medical problem. Rules are being defined concerning which information has to be available for different healthcare workers in various parts of medical diagnostics and treatment.

**Surveillance of Access by Patients.** With increased access to patient information, the patient has to feel safe about the use of his/her own medical data. At any time, the
patients can access their own information on the web at "My Page" and see which information has been accessed, when and by whom. As a side-effect, this will also allow the patients to follow the work that is being done by healthcare personnel concerning their own treatment.

**Information Exchange.** Information exchange using messaging (EDI) is still being used for operational tasks such as requests for services and reporting of status. However, the transfer of copies of documents from the patient's medical record is reduced since this information is available on demand from the original source.

**Individually Adjusted Working Pattern.** Various application systems have been around for more than 30 years providing a more or less uniform user interface. These systems will be increasingly adjusted for the tasks to be performed by the actual user and will also provide guidance according to the user’s wishes. Intelligent process support warns the user when abnormal situations are detected.

The user is also allowed to specify his/her user preferences concerning presentation and registration of information and which information elements this user wants to be available.

**On-line Telemedicine.** Traditional on-line telemedicine services like video-conferences are still being used to a limited extent for special purposes. However, the use of commonly available units like PCs and mobile phones with cameras are being used as an extension of the ordinary telephone consultation with GPs and specialists.

### 3.2. Electronic Healthcare Record

**Increased Structuring of Information.** Within the next 5 years, the information in the EHR is increasingly stored as structured information allowing application systems to use these information elements for more than just storage and presentation.

Dictation and voice recognition, used for inputting of large text blocks, are being replaced by intelligent, structured registration performed by the actual healthcare worker himself. The application system guides the data collection based upon the actual problem of the patient and asks for crucial, missing information. Combined with the features of individual user preferences, this way of entering information significantly increases the quality of the diagnostic process.

Intelligent business processes allow the application to propose relevant diagnoses based on all available information (including results from laboratories and other service departments as well as current best practice) and correspondingly warn the user when non-standard or potentially dangerous procedures are being initiated. This provides significantly increased safety for the patients.

**Consistent Presentation of Information from Different Sources.** Since information, to a larger extent, is being kept at its original location, the application system accesses these locations and presents the merged information as if it all should have been collected from the local storage.

**Intelligent Presentation of Information.** The storing of structured information allows for better presentation of information. The application system allows for easy navigation throughout the complete medical record of the patient only limited by the access granted for the actual purpose. The system is able to present chronological views of all contact episodes or to present the development of specific clinical

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1 "Min Side" in Norwegian.
2 Such as PAS, HIS, RIS, etc.
parameters. The user may, at any time, select an item and ask for additional information. The information presented can be in graphical format or consist of pictures, videos, etc.

**Overview of Ongoing and Scheduled Activities.** The traditional patient summary of earlier episodes of disease and current treatment is supplemented with an overview of ongoing and scheduled activities in general also including such activities during hospital stays. This allows for coordination of planned activities and better information to the patient about ongoing treatment.

### 3.3. Medical Diagnostics and Treatment

**Evidence Based Medicine.** National guidelines for adequate medical treatment based upon evidence based medicine is published and made available to the vendors of medical software to incorporate in decision support, both inside hospitals as well as in primary care services.

**Integrated Treatment Sequences.** Complex medical problems require the assistance of various specialists in a predefined sequence. These integrated treatment sequences are also defined as a part of the national recommendations allowing the whole sequence of activities to be performed as a single procedure in a scheduled way, once started.

**Individually Customised Treatment of Patients.** Patients are treated more individually based upon, among others, their ethnic background. The genetic composition of patients is used to adjust the incidence of various diseases in diagnostic procedures, for evaluation of laboratory test results as well as for the dosage of medication.

**Increased Patient Safety through Decision Support.** The structured information in the EHR allows for continuous decision support in all patient processes. Decision makers, such as physicians and nurses, are guided in their work and warned if a decision is deviating from either the national recommendations or the patient's genetic composition, providing increased safety for the patient.

### 3.4. Use of Technology for Diagnostics and Treatment

**Sensor-technology.** Use of sensors will allow for better surveillance of patients and make it possible to start treatment as soon as an abnormal situation is detected.

**Use of Simulators.** The use of medical simulators for the training of medical personnel may be of special interest in Norway where personnel may not get the necessary training for complex situations, due to the limited population and geographic distribution. Such simulators are used for surgical procedures, medical emergency procedures, anaesthesia as well as other complex situations.

### 3.5. Patient Services

**Self-treatment.** The "modern" patient is much more interested in his/her own health and expects to participate in the medical decisions. By the end of year 2012, new application systems help the patient handle the enormous amount of information available on the internet and to evaluate the relevant information related to the patient's situation. The use of a personal electronic health record can be part of such tools or be...
used separately. Personal electronic records ease the communication between the patient and involved health care personnel and participate to better treatment.

**Electronic Communication between Patient and Healthcare.** Secure e-mail is used for communication between the patient and assigned healthcare personnel. Simple questions may be solved without a physical consultation and pictures and videos may be attached. The ability to get in touch with qualified personnel, at any time, allows the patient to feel more comfortable so that the patient copes better with the situation.

Electronic communication is also used for scheduling appointments and for managing prescriptions through the web service "My Page". Here, the patient may also access his or her own medical record, view the patient summary, including on-going and scheduled activities, as well as get an overview of the usage of his/her medical record by others.

3.6. Auditing and Reporting

There is an increased interest for being able to monitor the effects of various health-related initiatives. The structuring of the EHR and the use of standardised definitions, allows managers to obtain national conclusions without having to establish a new national registry. The same feature allows for an improved and more up-to-date management of activities and costs, both locally, regionally and nationally.

4. Conclusions

The evolution is a continuous process and hopefully most of the expected new features will be operational by the end of 2012. However, wide-spread uptake of new technology is a fairly slow process and we, therefore, do not expect all features to be used by everybody by this date. In spite of this, we expect increased use of ICT in healthcare, by 2012, to provide, among others, increased service to patients and healthcare personnel, increased patient safety, better continuity of care as well as better diagnostics and treatment.

References


