The Core Data Elements of Electronic Health Record in Finland

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Abstract
Delivery of good care, ability to communicate effectively about patient care and the decision-making during the care process depends on the quality of the information available to all professions and between sectors. The main purpose of an electronic health record is to support the multidisciplinary communication, cooperation and decision-making in the patient’s care process. In addition, the data in electronic health records are used, e.g. in clinical research, health system management, the planning of health services and government reporting. A nationwide electronic health record will be introduced in Finland by the end 2007. Reaching this target has been a special part of the national health project. In a subproject of the introduction of a national electronic health record, core data elements of electronic health record have been defined through a consensus-based approach. The main elements are the patient identification information, the provider’s identification information, care episode, risk factors, health patterns, vital signs, health problems and diagnosis, nursing minimum data set, surgical procedures, tests and examinations, information about medication, preventive measures, medical statements, functional status, technical aids, living will, tissue donor will, discharge summary, follow-up care plan and consent information. Furthermore, existing vocabularies, nomenclatures, classifications and codes were clarified. The HL7 Finland has defined the manner in which this information is expressed in the CDA R2 structure. The core information elements will be implemented in regional development projects which are partly funded by the Ministry of Social Affairs and Health. This paper presents the defining process of the national core data elements of electronic health record systems in Finland.

Keywords:
Medical Records Systems; Computerized; Standards; Medical Informatics; Nursing Informatics

1. Introduction

According to the Decision in Principle by the Council of State [1] on Securing the Future of Healthcare,”Nationwide electronic patient records will be introduced by the end of 2007”. In this article, the term electronic health record is used according to the ISO (International Organization for Standardization) definition [2]. Implementation of a national electronic health record is one of the key issues in reforming the activities and the structures of health care. The Ministry of Social Affairs and Health coordinates the implementation of the National Electronic Health Record in Finland. The National Electronic Health Record Introduction project is a part of a national project to ensure the future of health care the aim of which is to evaluate the existing and threatening problems of the service system as well as to prepare a plan and action programme to eliminate the problems. The objective of the project
is to ensure equal availability, quality and sufficiency of care in the different parts of the country.

The history of patient care documentation is long. The development of the documentation has changed from physician’s notes to multi-disciplinary paper record. The need for collecting data from different professionals raise up when more people take part of patient’s care. Therefore, the recommendations for a unified national manual patient record has been determined apart from specialized medical care [3] and primary health care [4] and used widely for more than 30 years. Electronic health records have been available for several years mostly in primary care [5]. The first electronic health record system, Finstar, was introduced in 1982. In primary care, 93.6 % of health centres and 82 % of private sector organisations used electronic health record in 2003. In addition 62 % of hospitals used electronic health record in some clinics. [6] However, there is a number of different computerized information systems and, also, the same software application can differ between organisations. Some of applications include, e.g. laboratory and radiology components but there are also separate departmental systems, e.g. laboratory, radiology reporting, intensive care, or maternity. Most of the present-day electronic health record applications are based on the idea of a paper-based record simply turned into an electronic form. Due to this, the possibilities of information and communication technology (ICT) are not fully utilized. These electronic health record systems are poorly structured, even if the core elements of the electronic health record have been determined [7]. They are also passive and inflexible and do not support the continuity of care, quality assessment, education, health care management or statistics automatically. Furthermore, the development of the electronic health record systems has taken place under the control of commercial software producers and has aimed only towards immediate practical solutions [5].

2. The National Project Organisation

The Ministry of Social Affairs and Health has set up a Working Group to guide the introduction of electronic health record documents. One task of the Working Group was to create a strategy [8] for promoting the introduction of interoperability into electronic health records within health care organisations. The aim of the strategy is to provide possibilities for required data exchange in interoperable electronic health records and to build infrastructure supporting the computerized information systems used within health care.

The vision of the national electronic health record introduction project (2003–2007) is that the minimum requirements for the electronic health records will be met in all electronic health record systems. The purpose is to give the health care organisations a means through which health care professionals, by using information systems, are able to deliver effective, safe, seamless and high-quality care and maintain the best quality of information. The data can be utilized among the organisations or used regionally which guarantees the continuity of care. Further, the electronic health record allows managers to plan better services with available high-quality data.

The national electronic health record introduction project includes many subprojects which address different issues, e.g. the core data elements, open interfaces, data security, document metadata, national code and terminology server, architecture and documentation of nursing care. The different subprojects are coordinated, and the results of subprojects are cross-utilized in other projects. The purpose of this paper is to report the first results of the core data elements subproject.

The national electronic health record introduction project has followed on-going international projects which aim to develop an infrastructure for national health care with an electronic health record at its core, for example, in Canada [9], Australia [10] and England [11].
under way. Moreover, the work of standardization organisations ISO, CEN and HL7 has been followed. The common elements of these international projects are: 1) patients have access on their own health records and can control the use of information 2) need to define the core information 3) need to choose standards, nomenclatures, codes and vocabularies and their implementation 4) need to develop data security infrastructure and policies 5) aim to produce open, standard-based and interoperable solutions 6) need to divide the development work in subprojects. Further all these international projects focus on data exchange in interoperable electronic health records. However, the core information data varies between different countries.

3. The process of defining the core data elements of electronic health record

The aim of the project is to determine the core data elements and the structure of the electronic health record. The core data mean that the information required for data exchange between information systems uses a standardized form. The core data are defined as the data that can be standardized. The documentation of the core data requires the use of vocabularies, nomenclatures and classifications. Available terminologies have been defined if possible. The core information is the most significant information in the patient care process in the different health care sectors. It contains the health or disease information of patient. The core information is formed chronologically during the care of patient by different professionals. The aim of core information is to give a holistic view of the patient’s health and disease history and the care and guidance given. Further health information needs e.g. statistics, health policy and management should be take account. All these different purposes of data reuse should be considered in defining data elements.

As a basis, a list of items was formulated. The list of items was based on earlier broad definitions for the content of the whole electronic patient record and on the Decree of the Ministry of Social Affairs and Health 99/2001. Delphi method was used to reach a national consensus of the data elements. The definitions of the core data elements and terminologies were founded on two consensus seminars and working group meetings. The definitions were also publicly available for comments through the Internet. The participants of the consensus seminars and working groups included health professionals, electronic health record vendors, representatives of health managers, and experts of hospital districts. The electronic health record vendors and the experts of hospital districts will be committed to implement definitions to electronic health record systems through the involvement in the definition process.

4. The core content of the electronic health record

The core data set of the electronic health record was determined in 2003 (Table 1). Furthermore, the existing terminologies and codes have been clarified for the use of the core data elements. The data can be exchanged between the health care organisations based on the consent of the patient during the caring process. The data can be used to generate reports for institutional, regional or national repositories. The referral and discharge letters can also be generated with the data in the electronic health record. The decision support systems can be connected, e.g. to support diagnosis making or choice of the treatment protocol.
### Table 1 - Core data elements of the electronic health record in Finland

<table>
<thead>
<tr>
<th>The core data element</th>
<th>Terminology/Code</th>
<th>Meaning and use of the core information</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient identification data</td>
<td>ISO OID (Object Identifiers)</td>
<td>The data include, e.g. the patient’s name, social security number, and address. The data are used to identify the patient and to contact the patient.</td>
</tr>
<tr>
<td>The provider’s identification data</td>
<td>ISO OID</td>
<td>The data include, e.g. the name of the organisation and the health care professional. The data are used to identify the organisation and the health care professional.</td>
</tr>
<tr>
<td>The episode of care</td>
<td>ISO OID</td>
<td>The data are used to identify the episode of care and link the data with certain episode of care.</td>
</tr>
<tr>
<td>Risk factors</td>
<td>ICD-10 (The International Statistical Classification of Diseases and Related Health Problems) ICPC (International Classification of Primary Care)</td>
<td>The data include, e.g. allergies and infectious diseases. The information is used to warn the health professionals about risks that require medical attention or that certain conditions must be met to allow a specific procedure during the current or future care process.</td>
</tr>
<tr>
<td>Health patterns</td>
<td>-</td>
<td>The information gives details relating to relevant lifestyle, e.g. smoking, and the use of alcohol. The information is needed during the current care.</td>
</tr>
<tr>
<td>Vital signs</td>
<td>LOINC (Logical Observation Identifiers Names and Codes)</td>
<td>The data include, e.g. height and blood pressure. The information is needed during current and future care. The numeric or graphic lists of vital signs could be drawn up by describing the variation of the sign. The vital signs could be connected to the guidelines.</td>
</tr>
<tr>
<td>Health problems and diagnosis</td>
<td>ICD-10 I CPC</td>
<td>Diagnosis lists and problem lists could be drawn up. The guidelines could be connected to the diagnosis.</td>
</tr>
<tr>
<td>The nursing minimum data set</td>
<td>Several national classifications, some of them based on international classifications, e.g. CCC (Clinical Care Classification)</td>
<td>The data include nursing diagnosis, interventions, outcomes, intensity and discharge summary. The data are gathered with a structured documentation during the nursing process. The information is used during future care.</td>
</tr>
<tr>
<td>Surgical procedures</td>
<td>National classification of surgical procedures</td>
<td>The information is used to assess the outcomes of procedures or complications. The information is needed for the health care professionals participating in current and future care. The information could be used to draw up procedure lists to complete the patient’s medical history. The guidelines could be connected to the procedures or allocation of resources.</td>
</tr>
<tr>
<td>Tests and examinations</td>
<td>National nomenclature of laboratory tests and national nomenclature of radiological examinations and procedures</td>
<td>The information consists of the results of laboratory tests and imaging reports. The information is used to assess the given care. The information is needed for the health care professionals participating in current and future care. The guidelines could be connected to the test and examination results and, also, the information could be related to the allocation of resources.</td>
</tr>
<tr>
<td>Information of medication</td>
<td>ATC (Anatomic Therapeutic Chemical Code)</td>
<td>The information is used to assess the results of medication or complications. The information is needed for the health care professionals participating in current and future care. The information could be used to form medication lists to complete the patient’s medical history. The guidelines could be connected to information concerning medication.</td>
</tr>
<tr>
<td>Prevention</td>
<td>ATC</td>
<td>The information describes the patient’s methods of prevention, e.g. immunisation.</td>
</tr>
</tbody>
</table>
Medical Statement is based on medical experts’ assessment of the patient, e.g., for a court of law. A medical certificate is a structured written document on the patient’s disease written by a physician, e.g., for the patient’s employers.

The information describes the patient’s present functionality. The information is needed for the healthcare professional and social workers participating in the patient’s follow-up care.

The information includes, e.g., the fact if the patient is using a wheelchair. The information is used in describing the technical aids the patient needs. The healthcare professionals participating in the patient’s follow-up care and the health management personnel need this information.

The information is used to announce the patient’s wish to donate his organs after death.

A signed document in which the patient gives the healthcare professionals the permission to end the care when curing care is not available or the patient cannot express his will.

A discharge summary is a description and an analysis of the events during the episode of care. The information is used by healthcare professionals in future care in the same organisation and in follow-up care in different organisations.

The information is needed for coordinating the follow-up care.

The information is needed for announcing the consent of patient to give his documentation to another health care organisation.

## 5. Conclusion

This paper describes the development of the core data elements of the electronic health records in Finland. The information needs of different stakeholders are taken account. The definition of the core data elements is just beginning to be introduced into the nationwide electronic healthcare record by the year 2007. The core data elements will be implemented in the different electronic health record systems in the regional development projects. The terminologies (nomenclatures, vocabularies and classifications) and codes needed in the electronic health care record systems will be obtained from the national code server. The gaps in the related terminologies and codes are also identified. The need for further specifications of data elements for certain medical specialities has emerged, e.g., in occupational health care, psychiatry, and dental care. The implementation of the electronic health record has caused large behavioural and organisational changes. Thus, it is evident that educational activities must be included in the electronic health care introduction project.

There are many benefits which could be achieved after the core data elements have been implemented to the electronic health records. The structured and coded data elements of the electronic health records will facilitate the finding of the essential information when structured data work as a link to free text. The development of reminders and alerts in the electronic health record as well as links to medical knowledge is possible. The interoperability between different electronic health record systems is achieved, which guarantees the continuity of care. Structured data elements support the quality management, evaluation, benchmarking and statistics. And all of this benefits the patient.
6. Acknowledgements

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7. References


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