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Reusing Clinical Information in EHR

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Many countries currently develop their national strategic projects to achieve a safe and unified exchange of patient information in healthcare. Such developments and projects demand sector wide use of international standards. The challenge in such development is to combine the information needs at a national level, for instance for national vital health statistics, with the patients' wishes to health record access and control, and the needs of clinicians for very detailed discrete and complex health data and process management.

The Strategic Mindset: Standardisation and Efficiency

As such, these national strategies require a mindset which spans a range of issues from the standardisation of a single atomic data item concerning one individual patient, to the determination of outcomes and necessary resources at the national - and even international - level. Based on a fivelevel strategic information model covering individual data, results of clinical reasoning, aggregating on group level for different purposes, aggregation on population level, and finally the international data comparison, the perspective of clinicians are presented here.

The assumption is that correct and efficient data capture at the point of care, including data entry by patients themselves, gives the most reliable collection, provided that standards are used in every step along this strategic information model.

A Multitude of Standards and Choices

From a clinician's perspective, there are several types of standards available and necessary for sensible and useful application of information and communication technology (ICT) in Health Care. This contribution presents a typology of relevant standards for use in electronic health records and electronic messages, including for quality care, vocabulary, information modelling, workflow and technical. Once it is clear what information needs to be documented, stored, managed, and exchanged, the modelling of clinical content with use of standards for the electronic health record and electronic messages can be addressed.

The use of care information models (such as clinical templates or archetypes) to structure clinical information and to define the technical specifications leads to the conclusion that this is a feasible and economic approach to developing and applying standards that combine all clinical and technical requirements for use of ICT in Health Care.

It is further assumed that the care information models are standardised in such a manner that reuse is possible, including for aggregation for quality assurance, billing, policy making, and national health statistics, without having to ask clinicians for additional data collection activity. Semantic interoperability between EPR (electronic patient record) systems in health care has been defined by this author as 'the electronic exchange of clinical patient information in such a format that the intended meaning of the information from the sender can be interpreted by the receiver without changes or loss'. The addition of 'intelligence' to this definition implies that clinically relevant knowledge is applied to the content, structuring and processing of the electronic documentation and of the information exchange.

The Dutch Approach

In the Netherlands, the activities of the National ICT institute for Health Care (www.nictiz.nl) lead to the emergence of standards for electronic message exchange and development of EPRs. The Netherlands have based their 'information for health care' strategy on the message paradigm, applying the international Health Level 7 version 3 (HL7 v3) standard for the safe exchange of patient information to authorized users via a national infrastructure called AORTA.

HL7 v3 is used in about 20 projects now as a method to determine (clinical) user needs, modelling these needs, and implement clinical content in

electronic messages. In addition, several vendors base their electronic patient record systems on the HL7 v3 models. A key part of the developments include the HL7 v3 messages for continuity of care: the care provision domain. This care provision message is meant for referrals, record exchange, discharge summaries and so on.

Five Types of Standards to Achieve Semantic Interoperability

Five core areas of standardisation are identified: clinical, vocabulary, models, workflow, and technical standards. Clinical standards for professional patient care are often guidelines, analysis of evidence, outcome indicators, assessment scales, and programs for disease management. These contain domain knowledge which must be represented in the applications and messages, and data entry for the required data must be supported.

A second type of standards concerns health care terminology. Terminologies consist of very different formats and are usually developed for a specific purpose, such as clinical documentation, comparison of data, or statistical reporting. Terminology gives clinicians the appropriate words to describe what they see and hear from the patient and

define what they do.

The third type focuses on information models for the electronic recording and exchange of information in health care information systems. For instance, CEN 13606 (from the European Committee for Standardisation) and HL7 provide standard models for designing the recording, exchange, management and integration of data that support patient care.

The fourth type of standards deals with workflow or processes management, and describe how the care for patients evolves, who is involved and when, who interacts with whom, and what needs to be done in what order. Finally, the technical standards are numerous, and include infrastructure, networking, system technical aspects and certainly the security measures and legal issues for data security and privacy protection.

Integration of Standards in Care Information Models: One Effort, Multiple Use

Sorting out what standards exactly fit together to achieve the desired semantic interoperability on the national level is a huge effort. Billions of Euros are invested in this, so any method to make the development quicker, transformation between standards feasible, and the reuse possible, is considered an asset.

One of the projects of Nictiz concerns an EPR system for stroke patients. In stroke care a wealth of clinical knowledge, assessment instruments, data and vocabularies needs to be included in ICT for continuity of care. In a combined effort of the author and a Dutch company, developer of the stroke system, the care information models were developed to serve as a reusable building block within the framework of HL7 v3 Care Provision messages. The concept of a care information model was introduced to achieve a manageable approach to HL7 messages that also could be used for EPR development.

Care information models combine different standards materials and create valuable content for intelligent semantic

interoperability. They are a communication bridge between clinicians and technicians and facilitate inputs into the technical development of electronic messages and EPR systems. The document structure for the care information models consists of meta-information, detailed description of the clinical instrument, including variables, values, coding and data specifications, and the reason and method for its application in practice. It specifies the clinical data for use in the HL7 v3 message standard and maps every variable to its exact position in the message model and in the technical XML message specification. In addition, items like copyrights of source materials, disclaimer, and intended use of the care information models are addressed.

An overview of care information models for stroke are available at the Website www.zorginformatiemodel.nl.

Many of these care information models have been reused elsewhere. For instance, the vital signs panel is necessary in almost every clinical area. The Glasgow Coma Scale was modeled for stroke care, but could also be implemented in a system for the trauma registration for national statistics.

We are currently in the process of developing these care information models for different clinical areas and different health care sectors. It started in curative medicine, and is now moving to care for ageing and handicapped and to social support. The work is carried out in such a way that the results also function as the clinical description and vocabulary binding in the archetype framework of the CEN 13606- 2 standard.

Thus, the care information models bridge and combine the different standards paradigms necessary to achieve semantic interoperability and allow the collection of a discrete data item and, along with the five layer strategic model for health data aggregation, its reuse for national statistics.

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