

## DATA EXCHANGE STANDARDS IN HEALTHCARE

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**ABSTRACT:** The electronic health record structure and the general interoperability of the eHealth systems and solutions represent the cornerstones on which the continuity of patients care is based on at a regional, national or pan-European level. This continuity is sustained by better and cheaper electronic services. Currently there is still no common agreement regarding standards, norms and laws to allow a general interoperability of e-Health, but this future is not far - a relatively large number of associations and organizations are quite advanced in developing the necessary standards and in some countries the national public health system with eServices is quite developed [\*\*\*10a].

The interoperability of eHealth systems is their ability to work together to ensure the continuity of health care. This essentially involves the use of the same data structures (EHR, and others), which must be understood identically by all the systems and the ability to exchange messages on the communications lines (public networks like the Internet, private or dedicated), the messages being carriers of information. In addition, the interoperability must refer to a multitude of other issues such as the interoperability of the electronic identity (people, organizations and systems), medical terminology, licensed medical recommendations etc.

**KEYWORDS:** Interoperability, electronic system, electronic health record, evaluation, quality, certification, standards for data transmission, technical and functional requirements, design, implementation.

### 1. INTRODUCTION

The general problems of the identity and interoperability in e-Health are conceptually the same as those found in other areas. We thus have the same problems of electronic identity and interoperability at technical, semantic and organizational levels. As far as the area of deployment is concerned, the problem of interoperability concerns the level of the medical unit (among departments in a hospital, for example), the regional level (for groups of medical units that can use compatible systems), the national, pan-European and international level [\*\*\*10b].

The Electronic Health Record – EHR has gradually become a central issue of the national strategies regarding the development of the medical informatics in

most European countries. The necessity of sharing an increasing amount of clinical data, while maintaining the clinical significance of individual contributions, has led to a growing concern for the development and adoption of interoperability standards. The interoperability problem is the subject of many research projects and it is extensively discussed in various conferences. The first step from which we started was to clarify the need for interoperability leading to the following conclusions [\*\*\*07]:

- The interoperability is very effective in the health care act, for example when the patients medical data are needed in different locations to be accessible to the authorized persons.
- The interoperability is necessary when it comes to the data management from the patient's files. The time to fill in the patient data when he enters the emergency room is vital. Therefore, if the electronic health records systems could "communicate" between them, transmitting each patients data, the information could be accessed immediately regardless of where they are stored.

Therefore when it comes to sharing information among the medical information systems, which basically operates in the same way, the interoperability is very low.

The whole issue of interoperability in e-Health is not only a technical problem but it also includes legal, ethical, economic, social and cultural issues and its implementation at the national level is a necessary long-term action.

The efforts to achieve the interoperability of e-Health systems are mainly concentrated in the initiatives HL7, EHRcom, openEHR, IHE, EuroRec, and in the European projects Ride, Artemis, Hitch, Q-REC, EHR-Q<sup>TN</sup>.

Organization and structuring data must meet certain criteria necessary interoperability. Center for Information Technology Leadership described in 4 different categories (“levels”) of structured data that can be exchanged data.

While each are at different levels, each has different technical requirements and offers different

possibilities for benefits. The four levels are described in Table 1 [\*\*\*12].

**Table 1. The four levels of achieving interoperability**

Level	Data Type	Example
1	Non-electronic data	Paper, mail and phone
2	Data transmitted by devices	Fax, email and documents indexed.
3	Organizer data devices (messages structured, unstructured content)	HL 7 messages and documents, images and objects indexed (labeled).
4	Interpretation of data appears structured, standardized content.	Automatic transfer from an external laboratory results encoded in a provider's EHR. Data can be transmitted (or accessed without transmission) healthcare IT systems without the need for semantic interpretation or translation.

The recommendation of the European Commission regarding the cross-border interoperability of electronic systems of medical data defines interoperability as one of the most important priorities. The recommendation is based on the premise that in order to obtain good medical care across Europe is vital to connect people, systems and services. The same importance is given to the growth of the internal market for the free movement of patients, products and e-Health services.

Although interoperability is quite difficult to be obtained for various reasons including the political factor, the EuroRec European Institute suggested as a temporary solution an evaluation mechanism for certification by creating the EuroRec Seal Level 1 or EuroRec Seal Level 2.

The evaluation of the functional quality and consecutively the certification represents the only way that can ensure a high level of confidence and security for these systems, while ensuring compliance with the rules imposed by the national authorities. Although quality evaluation is not yet common practice across Europe, it is certain that the consistent introduction of quality evaluation measures will ensure and enhance the benefits of the computerization of the health system.

The main objective of the EuroRec warranty is to initiate a process of harmonization of the EHR systems to allow the cross-border interoperability of these systems. EuroRec warranty was not designed with the intention of replacing the existing certification systems. At this stage, it should be seen as a mechanism to avoid the re-certification of the EHR systems (eg. systems - already certified by other

bodies of the Community using consistent criteria as stipulated by EuroRec).

The EuroRec warrantee is a good first step towards interoperability by harmonizing applications.

The adoption of the EHR systems in Romania remained somewhat behind the international developments. The fact may be explained by the lack of an adequate legal framework and of financial mechanisms to encourage this process. The poor quality of many of the already implemented products is certainly another obstacle to adopting these systems. The development of the standards adopted to ensure the perfect interoperability of EHR systems has had a divergent evolution. Several architectural models and methods of interconnection have been developed, leading ultimately to the increased fragmentation of the market. The role of the EuroRec warrantee is not to verify the compliance with the applicable standards but to aim to gradually achieve them, starting from the developers real possibilities and taking into account the functionality required by users.

The development of the sets of functional criteria (requirements referred to the EHR systems of primary care and ambulatory care acute cases and was based on the requirements of almost 1400 collected from various sources as follows in Table 2) and the whole procedure of the medical systems evaluation developed in Ph.D thesis "Interoperability of The Electronic Recording systems of the Medical Data" have been implemented and tested in the European research project "EHR-Q<sup>TN</sup> – The Thematic Network for the Evaluation and Certification of the Quality of EHR Systems" [Apo11].

**Table 2. The selection criteria for certification in order to Q-Rec**

Functional criteria	QRec	BE	DK	IE	UK	CHITT	Total
Clinical: medication management	20	28	1	17		55	101
Clinical: health evaluation and documentation of diagnosis	17	48	20	10	54	7	139
Clinical: care planning and sharing	16	27	35	2	203	6	273
Clinical: documentation of results	9	60		2	61		123
Clinical: alerts, notifications and reminders	8	8	6	6	33	14	67
<i>Appointments and Schedules</i>		14	1	1	29		45
Demographic Services	11	26	8	24	62	5	125
<i>Services Department: references</i>		6					6
<i>Services Department: results</i>				5	2	1	8
<i>Services Department: laboratory</i>		1					1
<i>Services Department: radiology</i>		1			1		2

## 2. THE NATIONAL CORE DATA SET

Data use should drive the information system design. The first step is for the Romanian Ministry of health to determine what information it needs to use at each level of the health system in order to understand population health status and the services they are providing. This will permit personnel at all levels of the health system to plan and manage the health system and monitor performance. Each data element should be clearly defined with complete metadata. International standards are useful in developing this data set [\*\*\*06].

## 3. TECHNICAL DESIGN

Once the data set is defined, the information system can be described. This includes the source, communication, and use of each data element. The information system will include both manual (paper) and electronic components and the interfaces between the paper and electronic systems.

The information system should include data collection and use at all levels of the health system. This starts with the individual person and moves through the community, clinic, hospital, district, and national levels. The information system design will describe the collection, communication, and use of information including information flows to other levels.

Particular attention should be paid to the district level since this is the basic management unit of the health

system and is in the best position to translate information into action. Another focus of health information use is at the level of the point of care of the individual. Here, also, there is an opportunity to make best use of information.

The technical description should include data communication standards and security procedures to protect individual patient information.

## 4. OPEN STANDARDS

Once the data set has been identified it must be mapped to existing terminology and transport standards to enable intercommunication between various systems. Using open and freely available standards and terminologies such as LOINC and RxNorm allow for a more cost effective implementation within a country and permit any group involved in the engineering of an EHR or reporting system to implement a consistent data import and export capability.

## 5. USING KNOWLEDGE COMMUNITIES

Free open source software (FOSS) has developed a proven method of organizing communities to solve specific computer problems. FOSS development has as its foundation the free publication of software source code and documentation in order to foster widespread adoption and enhancement. Open source projects develop communities of developers and

users who freely share information, each building on the contributions of others.

This model provides a robust environment where innovation and adoption flourishes. A similar approach can be used for the mapping and implementation of an Romanian Ministry of health core data set to existing standards which involves participation from groups and organizations already involved in electronic data collection through EMRs and other systems within that country's jurisdiction. Individual groups come together and share their specific data models and approaches and map the Romanian Ministry of health core data set to their own systems. By collectively going through existing terminology, classification and data exchange standards, consensus can be achieved on precisely which terms and messages will be used in which contexts [\*\*\*09].

## 6. CONCLUSIONS

There will be many different individual computer applications that will make up the entire information system. These perform all of the unique functions necessary in the health information system.

The selection of these applications should be based on their ability to perform the function, their ability to incorporate standards, their ease of use, and their flexibility.

We have shown the benefits of using this model to develop open knowledge communities of software developers and implementers around an open source software project EuroRec Seal Level 2.

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