MEDICOORDINATION: REGIONAL IMPLEMENTATION FOR THE SWISS E-HEALTH STRATEGY

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ABSTRACT

Interest for medical IT infrastructures and interoperability between health professionals is growing. The electronic exchange of information is benefit (reduced cost, faster transmission, etc.) but misuses of such sensitive data must be avoided. Many countries or communities are establishing e-health strategies for a better interoperability. However it remains a complex problem. Indeed the number of developed standards and legal bases such as data protection, for instance, do not make it trivial. The Swiss Confederation is also working on an eHealth strategy. In this context, the MediCoordination project presented in this paper aims to analyse and validate the interoperability between health professionals at a regional scale and to implement two scenarios with prototypes. These scenarios have been created in collaboration with two hospitals, two private practices and a medical software provider. The first scenario is the release notice transmission from the hospital to private practices; the second is the admission of a patient in the hospital. The design and development of the prototypes has begun in early 2009. The experiences gained will be helpful for further wider projects.

KEYWORDS

Interoperability, e-health, health data exchange

1. INTRODUCTION

Information technologies take more and more space in the medical domain. Indeed, since the advent of Electronic Health Record[1] (EHR), the data management has greatly evolved (Haux, R., 2006 and Häyrinen, K. et al, 2008). The establishment of EHR infrastructures allows reducing costs, accelerating the transmission of medical data between health professionals, centralising patient information, etc. (Walker, J. et al, 2005). However, this amount of data is very interesting for many actors (insurances companies, research centres, etc.). Therefore, it is important that compliance to laws such as Federal Act on Data Protection is ensured.

In this context, countries (Scottish Government, 2008 and Australian Government, 2008) are establishing national strategies for medical interoperability between the different stakeholders. The European Union is leading an eHealth strategy too (Commission of European Communities, 2004). The Swiss Confederation is currently working on an eHealth strategy (Confédération Suisse, 2007) and several workgroups have been created to study and to propose recommendations on different aspects of an eHealth system: legal bases, IT infrastructures, financing, etc. The final recommendations about norms and architecture have been released on 20th April 2009 (Organe de coordination eHealth, 2009). One of the problems is the technical specifications, especially choosing among all existing standards (Eichelberg, M. et al, 2005):

HL7 (Health Level 7) propose messaging standards and a document structure to exchange medical information (HL7 Clinical Document Architecture). CEN (Comité Européen de Normalisation) 13606 also offers a general framework for exchanging data. OpenEHR offers an open source specification and a

[1] Healthcare Information and Management Systems Society, Electronic health record (EHR), http://www.himss.org/ASP/topics_ehr.asp, 2009.

reference implementation for EHR systems. IHE Profiles do not specify another standard, but explains how to use existing standards and technologies to achieve specific use cases. For instance, XDS Profile (Cross Enterprise Document Sharing) shows how implementing a document sharing infrastructure. Finally, there are still some standards to code information in medical domain: e.g. ICD-10 for diseases or ICHI for health interventions. It is now understandable why technical choices are not easy.

The MediCoordination project (http://www.medicoordination.ch) presented in this paper is a project lead in the context of the Swiss eHealth strategy. Its scope is at a regional scale, collaborating with medium-sized hospitals and private practices. Working with health partners helps identifying the most important scenarios and offers the possibility to implement prototypes in a real environment. The gained experiences will be helpful for further wider implementations.

2. MEDICOORDINATION PROJECT

The MediCoordination project comprises two distinct phases. The first phase is a global analysis of the current situation at regional scale (mainly cantons of Fribourg, Valais and Vaud). A state-of-the-art about standards and technologies has been done and many interviews have been organised. Another part has consisted of a requirements analysis and the specification of two use cases (release notice and admission). Researches on semantic interoperability, particularly transforming HL7 CDA documents into CEN 13606 or vice-versa have been done. They are among the most widely used standards and HL7 CDA will certainly be a part of the Swiss eHealth strategy recommendations. The second phase, which has begun in early 2009, is the design and the implementation of prototypes based on both use cases.

The following sections present the approaches and results obtained so far as part of MediCoordination project.

2.1 Interviews with health professionals

We met about 30 health professionals from various domains: hospitals, private practices, Swiss Medical Association, medical laboratories, insurance companies, medical information system producers, etc. We asked them various questions on their expectations, work environment, feelings about EHR, etc. From those interviews (which are not the matter of this paper), it mainly emerges that:

- Medical doctors are divided on the question of EHR. Most of them don't use EHR and don't agree in seeing medical data passing through the Internet.
- Few scenarios could quickly accelerate the exchange of medical documents between stakeholders (especially release notice or report).

The interviews have provided a very good overview of the situation and many contacts could be done. Some of them are now our partners for the continuation of the project.

2.2 Scenarios specifications for future implementations

We present in this section how the release notice and admission scenarios were specified and detail the release notice one.

2.2.1 Approach

The elaboration of the scenarios has been done in several stages. During a first meeting with health partners, the decision about the theme of both scenarios was taken: transmission of a release notice and admission of a patient. After studying the business processes of both hospitals and private practices, we proposed two detailed use cases, which were corrected and approved during a second meeting.

2.2.2 Results

Discussions with partners of regional hospitals and private practices help specifying clearly the use cases. They know what could be "computerised" and what must remain "manual" tasks. The first use case is the

transmission by the hospital of the release notice to general practitioners. The second is the admission of a patient at the hospital. We present hereunder the first one.

The release notice is a small document which contains a summary of a patient stay at the hospital. It is directly handed over to the patient at his leaving or faxed to the concerned general practitioner(s) and/or specialist physician(s). Two regional hospitals provided their business processes for several scenarios, particularly the generation of specific documents. Figure 1 shows an example of business process describing the steps for the creation of a release notice in one of the hospital partner.

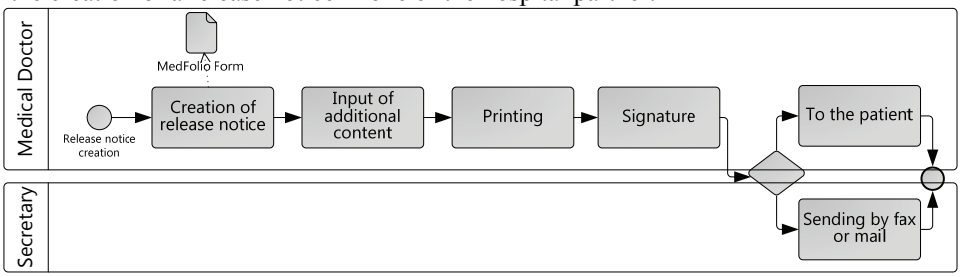

Figure 1 Release notice creation in one of the hospital partner

The medical doctor (MD) creates the release notice with a special form. S/He fills the document with additional information, prints and signs it. Then the release notice is either sent by fax/mail or handed over to the patient. Based on business processes, a proposition of scenario has been made. Table 1 details the basic flow of events (GP means general practitioner, family doctor or specialist physician).

Table 1 Description of the basic flow of events for the release notice scenario

Step	Description
1.	The MD creates a new release notice
2.	S/He chooses the recipients of the document
3.	S/He generates a document
4.	S/He fills the document with further information
5.	The document is encrypted
6.	S/He sends the document to the Documents Server
7.	The server warns the concerned general practitioner that a new document is available
8.	The general practitioner connects to the server and creates a secure channel
9.	The GP directly downloads the document in its application or computer using a secure channel (PDF and structured documents)
10.	The document is decrypted
11.	The GP checks the document and attests that the document is valid and correct.
12.	The GP logs out and closes the communication channel
13.	The server notifies the patient about document's access.

Figure 2 illustrates the scenario and the interaction between actors and resources. This scenario is going to be implemented in collaboration with medical partners: two hospitals, two GPs and a medical software provider. As this scenario is very close to the XDS IHE Profile, this one could be used as reference for the design and the implementation of the prototype. Several implementations of this IHE Profile already exist and have been tested during IHE Connectathons (http://www.ihe.net/Connectathon/), among which the Open Health Tools (https://iheprofiles.projects.openhealthtools.org/) and the IHE Integration Profile (http://ihe.codeplex.com/) projects.

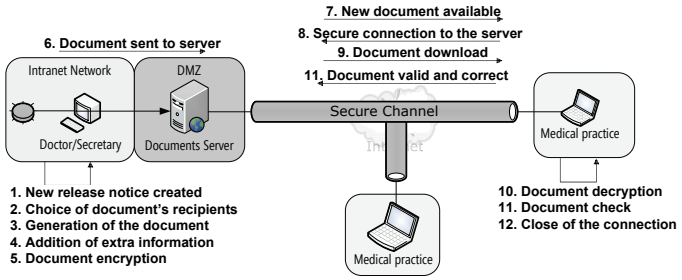

Figure 2 Illustration of the release notice scenario

Concerning the information transmitted in the scenario, it depends on the kind of document. A minimal set has been defined including in particular patient data, diagnoses and medication. We have also decided to transmit the information in two formats: PDF document with all information and structured document with only the diagnoses and medication for a first implementation. The diagnoses will be separated in free text block. We won't assign unique IDs to the diagnoses because this codification is almost only used for the invoicing. Furthermore, the GPs also prefer receiving the diagnoses as free text and they don't use codes for such documents. Concerning the medication, it will be structured as follow: a unique ID (Pharmacode or Product Number), the dosage (free text) and remarks (free text).

2.3 Discussion

The technology side of those scenarios can be managed. Existing standards have already been proofed and all security aspects can be covered. The challenge is now to make work all this together, remaining close to the recommendations of the Swiss eHealth strategy. Apart from the architecture and message exchanges, this is important that both parts understand the content itself. Therefore, in case were both part don't use same standards for documents, semantic interoperability mechanisms are required. At the moment, several solutions have been found: manual mapping, which is not a viable solution, XSL transformation using XML Schema to create the mapping (Yuksel, M. and Dogac, A., 2008), mapping using R-MIM and Archetype-based Semantic Transformations (Kilic, O. and Dogac, A., 2008), creating semantically identical specific templates (e.g. release notice) for each standard and converting them using XSLT rules for example. This last solution may be a good comprise between efficiency and manual work to do. This area of the project is still under research and could be inspired by works made in other domains such as eGovernement (Mugellini, E et al, 2005). Finally, the ethical side may be the critical point. The medical doctors have to be relieved, proving them that everything has been done to ensure the security of the patient and its data.

3. CONCLUSION

The interoperability in the medical domain is a complex task. National and international initiatives aim at managing legal bases, semantic interoperability, etc. to allow the exchange of medical data. In the context of the Swiss eHealth strategy, the MediCoordination project strives for gaining experiences in such infrastructure implementation by working first at a regional scale. A state-of-the-art through a lot of interviews and a requirements analysis has been done. We also have specified two scenarios in collaboration with health professionals and a prototype allowing the transmission of release notices between hospitals and GPs is being developed. Results of prototype will be available during the conference.

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REFERENCES

Australian Government, 2008. *National Ehealth Strategy*. Department of health and Ageing.

Commission of European Communities, 2004. E-health – making healthcare better for European citizens: An action plan for a European e-health. *Com(2004) 356.*

Confédération Suisse, 2007. *Stratégie Cybersanté (eHealth) Suisse*. Office Fédéral de la Santé Publique.

Eichelberg, M. et al, 2005. A Survey and Analysis of Electronic Healthcare Record Standards. *ACM Computing Surveys*, Vol. 37, No. 4, pp 277-315.

Haux, R., 2006. Health information systems - past, present, future. *International Journal of Medical Informatics*, Vol. 75, No. 3-4, pp 268-281.

Häyrinen, K. et al, 2008. Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International Journal of Medical Informatics*, Vol. 77, No. 5, pp 291-304.

Kilic, O. and Dogac, A., 2008. Achieving Clinical Statement Interoperability using R-MIM and Archetype-based Semantic Transformations. *Information Technology in Biomedicine, IEEE Transactions on: Accepted for future publication.* Vol., No., pp.

Mugellini, E et al, 2005. eGovSM Metadata Model: Towards a Flexible, Interoperable and Scalable eGovernment Service Marketplace. *IEEE Conference on e-Technology, e-Service and e-Commerce*, Hong Kong, China, pp.

Organe de coordination eHealth, 2009. *Standards und Architektur - Erste Empfehlungen.* Office Fédéral de la Santé Publique.

Scottish Government, 2008. *eHealth Strategy 2008-2011*.

Walker, J. et al, 2005. The Value of Health Care Information Exchange And interoperability. *Health Affairs-Millwood*, Vol. 24, No. 1, pp 10-18.

Yuksel, M. and Dogac, A., 2008. Transforming Turkey's National Health Information System Messages to HL7 CDAR2 and CEN EN 13606. *Proceedings of Show me your CDA! Interoperability Forum*. Crete, Greece, pp.