Generation of ELGA-Compatible Radiology Reports from the Vienna Hospital Association's EHR System

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Introduction

The ELGA system, which is planned to become operational by 2015, will provide semantic interoperable exchange of several types of medical documents between Austrian healthcare providers. For this purpose, all providers will have to transform their documents from the proprietary formats of their local EHR systems to a common standardized format and vice versa. As the common ELGA document standard, Health Level Seven (HL7) Clinical Document Architecture (CDA) Release 2.0 was selected.

Being one of the biggest hospital operators in Europe, the Vienna Hospital Association (KAV) will represent a prominent provider within the ELGA system. In the present work we present a solution for transforming radiology reports within the EHR system of the KAV from their proprietary format into an ELGA-compatible format.

Methods

Radiology Reports in the EHR System of the KAV

The EHR system of the KAV receives radiology reports from different radiology information systems (RIS); In the present work we focused on two RIS provided by Siemens respectively GE. Both RIS are able to export the reports as XML files for processing and transformation. XML Schema Definitions (XSD) exist that describe the possible content of these XML reports. All healthcare services documented in KAV radiology reports are coded within a local code system.

Radiology Reports in the ELGA System

In the ELGA system, radiology reports are represented as HL7 CDA documents that have to comply with the rules of the general implementation guide for ELGA documents, and with a specific implementation guide for digital imaging reports. Whereas the former is concerned with the CDA header, the latter primarily focuses on the body of the reports. All healthcare services are coded within the open code system APPC (acronym for Austrian PACS Procedure Code).

Transformation of KAV Reports into ELGA Reports

In the first step of the transformation process an existing adaptor of the KAV ("CDA creator") is used to generate a generic CDA stub from a KAV EHR document. It fills those fields of the CDA header with valid metadata, for which the ELGA implementation guides contain fixed value prescriptions. In the second step all fixed values of the CDA body are loaded from a separate configuration file. Further, the variable data that are fetched from the original report and adapted according to the implementation guides are inserted in the corresponding fields of the CDA header and body. All radiologic services documented in the local KAV code system have to be converted to the four axes of the APPC. For each radiologic service an individual *serviceEvent* entry is created in the ELGA radiology report. Our prototype was implemented in JAVA which allowed us to use various existing procedures for extracting data from different external file formats, such as XML or XLS.

Results

Within our tests, all mandatory fields and 25% of the optional fields within the header of the generated ELGA reports could be fed on average from our source KAV reports (compare table 1). Within the body of the generated ELGA reports, all mandatory fields could be fed for the GE reports. For the Siemens reports, the mandatory sections "requested imaging studies information" and "history general" had to be filled with the standard text "request is not provided" respectively "anamnesis is not provided". From the optional fields in the body, 21% (GE) respectively 7% (Siemens) could be fed on average. From a total of approximately 15,000 codes within the local KAV code system, 3,795 could be mapped to the APPC schema by means of simple String matching (compare figure1). The ELGA Online validator currently reports two open problems with our generated reports.

ELGA radiology report	CDA Header		CDA Body	
	contains fields	fields fed with data	contains fields	fields fed with data
mandatory	17	17	3	3 (GE) 1 (Siemens)
optional	12	3	14	3 (GE) 1 (Siemens)

Table 1: Number of fields in ELGA reports that could be fed in average

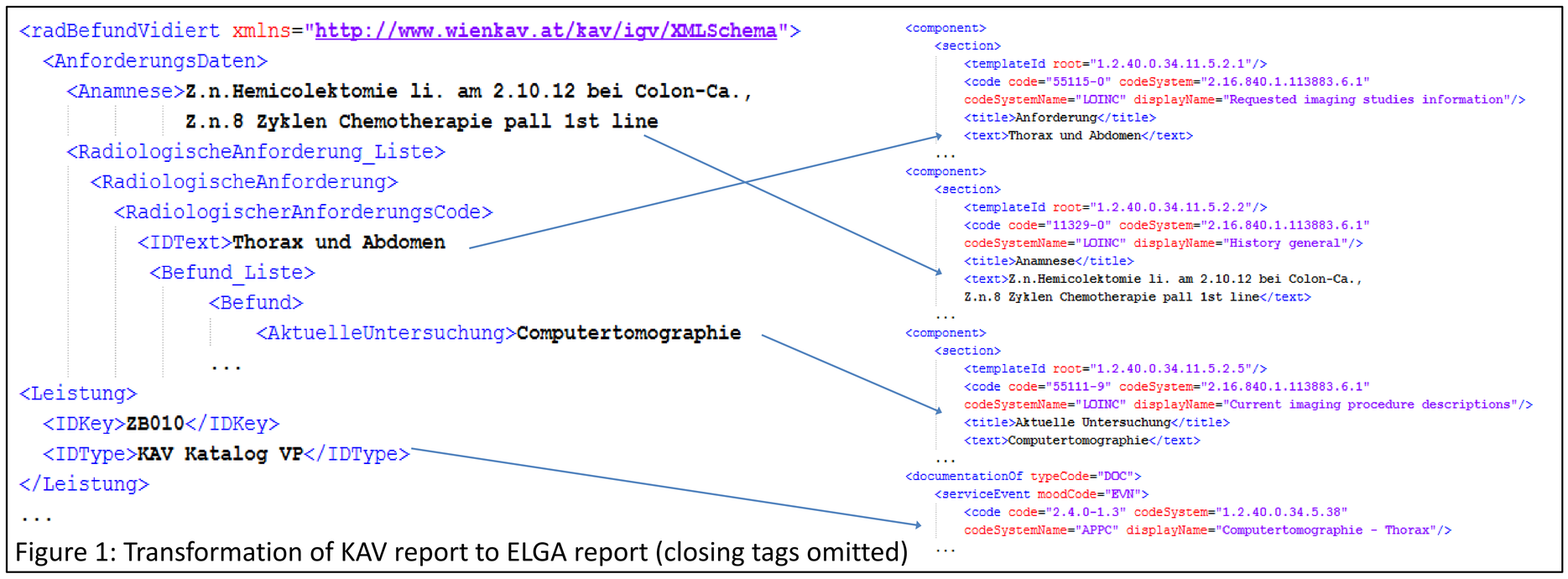

Figure 1: Transformation of KAV report to ELGA report (closing tags omitted)

Conclusion

Concerning the percentage of fields that could be successfully transformed, the mandatory fields are well supplied by the GE reports. Within the Siemens reports no data was contained for two of these fields. For the optional fields only a low filling level (23% for GE reports, 15% for Siemens reports) could be achieved. To increase the informative content of the resulting reports, the use of additional information sources within the KAV system should be considered. Information loss occurred when the partly more detailed KAV codes were transformed to APPC codes. Some fields present in the source reports were not included in the ELGA reports. As these fields referred to KAV-internal information, this information loss is probably less problematic for KAV-external ELGA users. The two open validation errors seem to be bugs of the ELGA Online validator. It indicates an error if more than one serviceEvent is documented in the report, although the ELGA implementation guide explicitly allows more than one. Further it yields an error, if the "laterality" axis within an APPC code is set to zero, even though the APPC schema permits zero as "undefined" value. A medical validation of our mappings concerning the transformation of reports and the transformation of KAV codes to the APPC remains to be done.

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