Automated on-demand generation of patient summary documents

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ABSTRACT:
Patient summary documents provide crucial information about a patient which are necessary for an efficient and safe treatment and present a quick overview of the patient's health status. Automatically generating patient summaries from electronic health records reduces workload of medical personnel. Based on a health standard-compliant approach, a system for on-demand creation of patient summaries was implemented and evaluated using real data.

1 INTRODUCTION

The amount of health records medical personnel, like physicians and nurses, are facing increases while the available time per patient decreases. A summarization of a patient's health records, which presents vital information at first glance, could reduce workload and improve the quality of care. [1] [2]

The information that should be provided by a patient summary, has been identified in a European guideline [2]. It has also been part of the epSOS project, which aims to provide seamless cross-border healthcare to European citizens [3], and of the ELGA, project, which is in the process of defining a patient summary [4]. This paper shows a fully automated approach to generate and maintain a patient summary document.

2 METHODS

The presented approach is based on an Integrating the Healthcare Enterprise (IHE) [5] compliant system, and uses the Health Level 7 Version 3 Clinical Document Architecture Release 2 (CDA) [6] standard as data format.

In a medical environment most information about a patient is stored in documents that record present and past treatments of a patient. The CDA standard was defined by HL7 [7]. The data model of CDA is based on a Refined Message Information Model (R-MIM) [7]. A CDA document is an XML document which is split into header and body. The header contains document metadata [8]. The body contains medical information and is classified in three different levels [6], [8] Level 1 content includes embedded non-xml content, such as pdf files or images, and uncoded, unstructured sections. Level 2 requires a basic structure in XML, which divides medical information into sections identified by codes, thus defining the class of information available. These codes are based on existing coding systems like LOINC [9] and SNOMED CT [10]. Level 3 extends level 2 documents and requires fully structured medical information according to defined CDA Templates, which can be identified by codes and to the HL7-RIM.

The CDA standard was used for both the source data and the generated document. It assigns unique document identifiers that can be used to make the information-sources traceable by defining a CDA template which combines the source document-id with the extracted data. CDA templates allow the extension of the CDA standard by defining additional data-items that can be used in the document, or restricting the use of data items [8]. Using the CDA standard as format for the source-data allows the recognition of what information should be present in the generated patient summary. The assigned codes in Level 3 allow to identify the type of information presented, and as such can be used to determine whether an item shall be included in the pa-

tient summary. This holds partially true for the CDA Level 2 in which at least a section of data can be identified.

IHE uses existing standards such as HL7 V3 and CDA to enable healthcare interoperability. The IT Infrastructure framework describes the profile Cross-Enterprise Document Sharing (XDS-b). It can be used to store and transmit medical documents. [5]

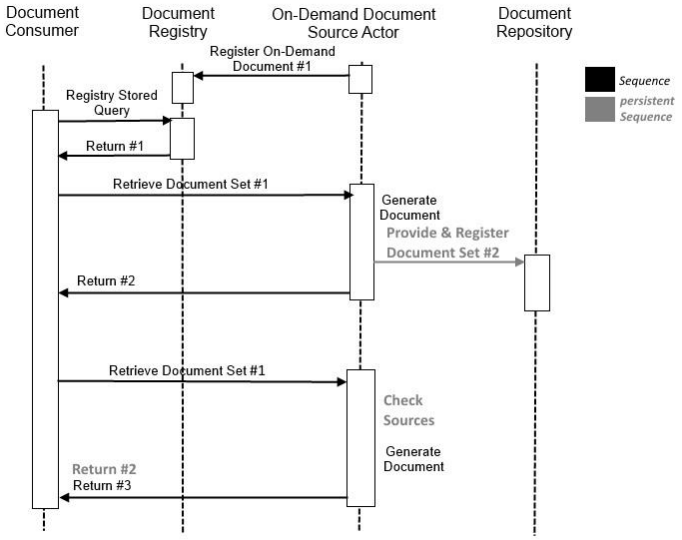

Figure 1. Retrieving an on demand document (simplified).

The IHE XDS Profile consists of actors which communicate with each other over transactions. This includes the On-Demand Document (ODD) Source Actor which is used to generate documents at the time of request. Figure 1 shows how a patient summary is created.

3 RESULTS

The source data is retrieved by querying the Document Repository for available documents to a patient. The retrieved documents are filtered for important content by using the codes existing in the CDA levels. CDA Level 1 is ignored, in Level 2 the entire section is transferred to the patient summary and Level 3 is analyzed and transferred per single data-item. The document identifier used by IHE to transfer the data is used in a CDA template to identify source documents of data items. Implementing IHE already takes care of the problem of making document access traceable [11]. In addition to the transactions defined in XDS-b the solution implements an additional transaction outside of IHE that the Document Consumer can use to trigger Register On-Demand Document Entry [ITI-61] and create a patient summary for a specific patient.

4 CONCLUSION

The fully automated generation of patient summary documents from the data existing in a healthcare environment when they are required is possible.

Concerning the processing of the existing data in a healthcare environment, the presented solution still leaves open the question how to handle CDA Level 1 data which does not have codes for identification of the type of data, and may not even be structured at all. It was determined that most of the available data existed in Level 2. This reinforces the correctness of the decision to include Level 2 data, which only *might* have valuable information, since the information available in Level 3 is at the time of writing in no way enough to generate a useful patient summary.

The topics discussed here are further expanded upon in [12].

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