Chapter 2.22
A Distributed Patient Identification Protocol Based on Control Numbers with Semantic Annotation

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ABSTRACT

One important problem of information systems in health care is the localisation and access to electronic patient records across health care institute boundaries, especially in an international setting. The complexity of the problem is increased by the absence of a globally accepted standard for electronic health care records, the absence of unique patient identifiers in most countries, and the strict data protection requirements that apply to clinical documents. This article describes a protocol that allows the identification of locations of patient records for a given patient and provides access to these records, if granted, under consideration of the legal and technical requirements. The protocol combines cryptographic techniques with semantic annotation and mediation and presents a simple Web-service-based access to clinical documents.

INTRODUCTION

Information technology used in the health care sector is most often characterised by heterogeneity of systems, longevity of data and devices, and high availability requirements. While the heterogeneity and longevity of systems is a consequence of the fact that expensive special-purpose devices such

as MRI (magnetic resonance imaging) scanners are produced by only a few vendors and need to be integrated with the existing IT infrastructure, the longevity and availability requirements of medical data such as images and diagnostic reports are related directly to the care process. Since patient treatment needs to continue, even if some part of the IT infrastructure is off-line, a distributed data storage with loose message-based coupling between devices is used most often. This implies that data inconsistencies between systems are not unusual and need to be accounted for. These properties of IT systems in health care explain the pressing need for interface standardisation and interoperability in this field, reflected by comprehensive interface standards like DICOM (NEMA, 2004) and HL7 (2003). According to the CEN/ISSS eHealth Standardization Focus Group (2004), a study currently being performed at the request of the European Commission, the key strategic aims for applications of information and communication technology to health services include improving access to clinical records and enabling patient mobility and cross-border access to health care. While much work has been devoted to developing standard system interfaces for applications within a single health care enterprise (i.e., hospital or private practice), the digital cross-enterprise exchange of clinical records is certainly the exception rather than the norm today, particularly in the case of cross-border communication. A key issue in this field is the absence of a unique identifier that could be used to unambiguously identify records pertaining to a particular patient. In this article, we discuss requirements for locating and accessing clinical records across enterprise and country borders under consideration of data protection and propose a protocol based on control numbers and semantic annotation that addresses these requirements. This protocol is being developed within the framework of the ARTEMIS project, which is introduced in the following section.

THE ARTEMIS PROJECT

The ARTEMIS project (ARTEMIS Consortium, 2004; Dogac et al., in press), funded by the European Union, aims to improve the interoperability of clinical information systems among different organisations, based on Semantic Web Services and suitable domain ontologies. A health care organisation can join the ARTEMIS peer-to-peer (P2P) network and advertise electronic services, such as the provision of access to a patient's electronic health care record (given suitable authorisation) and access to different subsystems (e.g., patient admission or laboratory information systems). Within the ARTEMIS network, further services might be invoked dynamically, for example, in order to translate and map among different representations of health care information. In ARTEMIS, all participating health care organisations (peers) are coupled loosely via the ARTEMIS P2P network. Groups of participating organisations are coupled via so-called Super Peers, which are connected among each other. The project is carried out with partners from Turkey, Germany, Greece, and the United Kingdom.

THE PATIENT IDENTIFICATION PROTOCOL

While a number of projects currently are attempting to establish central electronic health record (EHR) archives for certain regions or countries, most clinical records are still kept and maintained at the place of their creation. This means that, given a patient with a disease requiring long-term treatment (such as diabetes), related clinical records may be located at one or more family doctors' practices, several specialists, labs, and a number of hospitals. In particular, the patient may not even be aware of all the locations where records relevant to a particular medical problem may be kept. Any protocol that attempts to make relevant clinical documents available in digital form needs

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